Environmental Protection Agency

40 CFR Parts 90 and 91

[FRL-5942-9]

RIN 2060-AE29

Phase 2 Emission Standards for New Nonroad Spark-Ignition Handheld Engines At or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final Rule.

SUMMARY: In this action, we are finalizing a second phase of regulations to control emissions from new nonroad spark-ignition handheld engines at or below 19 kilowatts (25 horsepower). The engines covered by this action are used principally in handheld lawn and garden equipment applications such as trimmers, leaf blowers, and chainsaws. The standards will result in an estimated 70 percent reduction of emissions of hydrocarbons plus oxides of nitrogen from handheld engine emissions under the current Phase 1 standards by year 2010. The standards will be phased in beginning with the 2002 model year. The standards will result in important reductions in emissions which contribute to excessively high ozone levels in many areas of the United States. We have estimated the cost at approximately $20 to $56 for individual units and significantly air quality benefits of 3.6 millions of HC over the life of the program.

In March 1999 we adopted Phase 2 regulations for small spark-ignition engines used in nonhandheld equipment. In this action we are including two provisions for Phase 2 nonhandheld engines that would partially modify the scope of the March 1999 final rule. First, we are adopting standards for two additional classes of nonhandheld engines that apply to engines below 100 cubic centimeters displacement used in nonhandheld equipment applications. Second, we are finalizing an option that allows manufacturers to certify engines greater than 19 kilowatts and less than or equal to one liter in displacement to the small engine Phase 2 standards.

With this document, we are also amending the provisions of the existing regulations for small spark-ignition nonroad engines at or below 19 kilowatts and marine spark-ignition nonroad engines. (We proposed these amendments in a separate notice, and received no comments objecting to the proposal.) For small spark-ignition nonroad engines at or below 19 kilowatts, we are revising the applicability of the rule to certain engines used in recreational applications and revising the applicability of the handheld emission standards to accommodate cleaner but heavier 4-stroke engines. For marine spark-ignition engines, we are amending the existing regulations to provide compliance flexibility for small volume engine manufacturers during the standards' phase in period. Lastly, we are adopting a minor revision to the existing replacement engine provisions for both small spark-ignition nonroad engines at or below 19 kilowatts and marine spark-ignition nonroad engines to address issues that may arise concerning the importation of such engines. No significant air quality impact is expected from the amendments included in today's action.

DATES: The amendments to 40 CFR parts 90 and 91 are effective [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Materials relevant to the Phase 2 provisions of this final rule, including the Final Regulatory Impact Analysis are contained in Public Docket A-96-55. Materials relevant to the amendments for small spark-ignition nonroad engines and marine spark-ignition engines are contained in Public Docket A-98-16. Both of these dockets are located at room M-1500, Waterside Mall (ground floor), U. S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460. The dockets may be inspected from 8:00 a.m. until 5:30 p.m. Monday through Friday. The docket may also be reached by telephone at (202) 260-7548. As provided in 40 CFR part 2, we may charge a reasonable fee for photocopying.

For further information on electronic availability of this final rule, see **SUPPLEMENTARY INFORMATION** below.

FOR FURTHER INFORMATION CONTACT: For information on the Phase 2 provisions adopted in today's action contact Philip Carlson, U.S. EPA, Office of Air and Radiation, Office of Transportation and Air Quality, Assessment and Standards Division, (734) 214-4270; carlson.philip@epa.gov. For information on the amendments to the existing provisions for small spark-ignition nonroad engines and marine spark-ignition engines contact John Guy, U.S. EPA, Office of Air and Radiation, Office of Transportation and Air Quality, Certification and Compliance Division, (202) 564-9276; guy.john@epa.gov.

SUPPLEMENTARY INFORMATION:

Regulated entities

Entities potentially regulated by this action are those that manufacture or introduce into commerce new small spark-ignition handheld or nonhandheld nonroad engines or equipment or new marine spark-ignition engines or equipment. Regulated categories and entities include:

Category	Examples of Regulated Entities
Industry	Manufacturers or importers of new nonroad small (at or below 19 kilowatt) spark-ignition handheld or nonhandheld engines and equipment.
	Manufacturers or importers of new marine spark-ignition outboard, personal watercraft, and jetboat engines and equipment.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that we are now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your company is regulated by this action, you should carefully examine the applicability criteria in Section 90.1 and Section 91.1 of Title 40 of the Code of Federal Regulations. If you have questions regarding the applicability of this action to a particular entity, consult the people listed in the preceding **FOR FURTHER**

INFORMATION CONTACT section.

Obtaining Electronic Copies of the Regulatory Documents

The preamble, regulatory language, Final Regulatory Impact Analysis, and Summary and Analysis of Comments are also available electronically from the EPA Internet Web site. This service is free of charge, except for any cost already incurred for Internet connectivity. The electronic version of this final rule is made available on the day of publication on the primary Web site listed below. The EPA Office of Transportation and Air Quality also publishes Federal Register notices and related documents on the secondary Web site listed below.

1. http://www.epa.gov/docs/fedrgstr/EPA-AIR/
   (select the desired date or use the "Search" feature)
2. http://www.epa.gov/OMSWWW/
   (look in "What's New" or under the specific rulemaking topic)

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I. Introduction

A. What is the Background of This Final Rule?

On January 27, 1998, we issued a Notice of Proposed Rulemaking (NPRM) proposing a second phase of regulations to control emissions from new handheld and nonhandheld nonroad spark-ignition (SI) engines at or below 19 kilowatts (kW), hereafter referred to as "small SI engines" (see 63 FR 3950). This action was preceded by a March 27, 1997, Advance Notice of Proposed Rulemaking (see 62 FR 14740). We solicited comment on all aspects of the January 1998 NPRM and held a public hearing on February 6, 1998. The public comment period for the January 1998 NPRM closed March 13, 1998. On March 30, 1999, we finalized Phase 2 standards and compliance program requirements for Class I and Class II nonhandheld engines (see 64 FR 15208). In the final rule for nonhandheld engines, we noted that we planned to address the Phase 2 program for handheld engines in future Federal Register documents. We issued a Supplemental Notice of Proposed Rulemaking (SNPRM) for Phase 2 handheld engines on July 28, 1999 (see 64 FR 40940). We solicited comment on all aspects of the July 1999 SNPRM and held a public hearing on August 17, 1999. The public comment period for the July 1999 SNPRM closed September 17, 1999. The purpose of today's final rule is to adopt Phase 2 standards and compliance program requirements for handheld engines.

Today's action also contains two provisions that affect nonhandheld engines. First, we are adopting standards and compliance program requirements for two newly designated classes of nonhandheld engines with displacements below 100 cubic centimeters (cc), hereafter referred to as Class I-A and Class I-B engines. Second, we are adopting an optional provision that allows manufacturers to certify engines above 19 kW with displacement less than or equal to one liter to the Phase 2 small SI engine regulations.

Today's action is taken in response to section 213(a)(3) of the Clean Air Act, 42 U.S.C. 7547, which requires our standards for nonroad engines and vehicles to achieve the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available, giving appropriate consideration to cost, lead time, noise, energy and safety factors. The standards and other compliance program requirements being adopted today satisfy this Clean Air Act mandate.

The development of this regulation started in 1996, shortly after the Phase I standards were finalized. Initially a formal regulatory negotiation process was attempted. After it became clear that the disparate interest of the multiple parties would not result in an agreement, the regulatory negotiation process was abandoned. Instead, at the request of industry, EPA developed the framework for a Phase II rule which was described in a Statement of Principles signed by manufacturers representing a significant portion of the US market. This SOP formed the basis for the Phase 2 NPRM

The January 1998 NPRM contained lengthy discussion of the first set of proposed Phase 2 standards, the expected costs of their implementation, and the technologies that we expected manufacturers would use to meet the standards. The January 1998 NPRM also discussed the potential costs and benefits of adopting more stringent standards such as the second phase of standards that were then under consideration by the California Air Resources Board (ARB). In the January 1998 NPRM, we explicitly asked for comment regarding the level of the proposed standards and the impacts and timing for implementing more stringent standards, so as to allow us to establish the most appropriate standards in the final rule. In particular, we requested

comment on the impacts and timing for implementing emission standards that would require the same types of technology as anticipated by proposed rules under consideration at that time by the California ARB.

After the close of the comment period on the January 1998 NPRM and upon reviewing information supplied during and after the comment period, we determined that it was desirable to get further details regarding the technological feasibility, cost and lead time implications of meeting standards more stringent than those contained in the January 1998 NPRM. The January 1998 NPRM already contained estimates of the costs and feasibility of more stringent standards. Some commenters had charged that, based on these discussions in the January 1998 NPRM, our proposed standards would not be stringent enough to satisfy the stringency requirements of Clean Air Act section 213(a)(3). For the purpose of gaining additional information on feasibility, cost and lead time implications of more stringent standards, we had several meetings, phone conversations, and written correspondence with specific engine manufacturers, with industry associations representing engine and equipment manufacturers, with developers of emission control technologies and suppliers of emission control hardware, with representatives of state regulatory associations, and with members of Congress. We also sought information relating to the impact on equipment manufacturers, if any, of changes in technology potentially required to meet more stringent standards than were proposed in the January 1998 NPRM. We published a Notice of Availability on December 1, 1998, highlighting the additional information gathered in response to the January 1998 NPRM (see 63 FR 66081) and continued having discussions with various parties regarding low emission technologies for the small SI handheld engine market.

Since the publication of the January 1998 NPRM, there have been rapid and dramatic advances in emission reduction technologies for handheld engines. We were not able to fully evaluate these technologies or discuss their possible availability at the time of the January 1998 NPRM. After having reviewed the most up-to-date information available on these new technologies, we believed the information supported Phase 2 standards for handheld engines that were significantly more stringent than those proposed in the January 1998 NPRM and even more stringent than the second phase of California ARB standards. In light of this new information, and in the interest of providing an opportunity for public comment on the stringent levels being considered for the Phase 2 handheld engine emission standards and the potential technologies available for meeting such standards, we reproposed Phase 2 regulations for handheld engines in the July 28, 1999, SNPRM (see 64 FR 40940). The July 1999 SNPRM proposed Phase 2 hydrocarbon plus oxides of nitrogen (HC+NOx) standards of 50 grams per kilowatt-hour (g/kW-hr) for Class III and Class IV engines and of 72 g/kW-hr for Class V engines, phased in over several years. The proposal also included an averaging, banking, and trading program. The July 1999 SNPRM also proposed revised compliance program requirements for handheld engines. Most of the proposed compliance program changes were intended to make the handheld engine compliance program the same as the requirements finalized for nonhandheld engines in March 1999 and to establish a consistent approach to compliance for all nonroad small SI engines.

In addition to the reproposed Phase 2 standards for handheld engines, we also proposed standards for two new classes of small displacement nonhandheld engines in the July 1999 SNPRM. We had requested comment on the need for such standards in the January 1998 NPRM

and received comments from a number of engine manufacturers supporting such standards. Originally, we did not propose different standards for small displacement nonhandheld engines citing the availability of the averaging, banking and trading program as a reason for not proposing separate standards. However, because the Phase 2 standards we finalized for nonhandheld Class I engines are more stringent than originally proposed in the January 1998 NPRM and because it is technologically more difficult to meet a given level of emissions (in g/kW-hr) as the engine displacement is decreased, manufacturers who would likely produce such small displacement engines would not likely be able to meet the Phase 2 Class I standards recently finalized and would not be able to produce such small displacement nonhandheld engines even if they could take advantage of the averaging, banking and trading program. Therefore, we proposed standards for two classes of small displacement nonhandheld engines that would take effect upon the effective date of today's final rule. The first small displacement class covered nonhandheld engines with displacements below 66cc and was referred to as Class I-A engines. The second small displacement class covered nonhandheld engines at or above 66cc and below 100cc and was referred to as Class I-B engines.

In response to a request from manufacturers of small engines, we also included in the July 1999 SNPRM a proposal to allow manufacturers the option of certifying engines greater than 19 kW and less than or equal to one liter in displacement to the small SI engine Phase 2 regulations for nonhandheld engines beginning with the 2001 model year. Because of their size, these engines are not required to be certified under the current Phase 1 small SI engine program, and they do not have to meet any previously existing Federal requirements because we do not

currently regulate spark-ignition engines above 19 kilowatts. However, because there are a small number of these engines that are primarily derivatives of other certified small SI engines at or below 19 kW, we believed it would be appropriate for manufacturers to have the option to certify these engines to the Phase 2 requirements for small SI engines. As noted in the July 1999 SNPRM, engines certified under the proposed option would be required to certify for the longest useful life period of 1,000 hours. The requirements of this option were consistent with those that had already been adopted by the California ARB.

We solicited comment on all aspects of the July 1999 SNPRM and held a public hearing on August 17, 1999. The public comment period for the July 1999 SNPRM closed September 17, 1999.

In addition to the Phase 2 provisions for small SI nonroad engines highlighted above, today's action adopts several minor amendments to the existing regulations for small SI nonroad engines and marine SI engines. These amendments were included in a separate proposal on February 3, 1999 (see 64 FR 5251). We originally promulgated final regulations applicable to small SI engines on July 3, 1995 (see 60 FR 34582, codified at 40 CFR Part 90) and final regulations applicable to spark-ignition marine outboard and personal watercraft (including jetboat) engines (marine SI engines) on October 4, 1996 (see 61 FR 52088, codified at 40 CFR Part 91).[1]

[1] The preamble to the final marine SI rule (61 FR 52090) explains that for purposes of the marine SI rule, jetboats are considered as personal watercraft, except where their engines are derived from sterndrive or inboard type marinized automotive blocks.

The small SI regulations took effect with model year 1997 for the majority of covered engines and in the 1998 model year for certain higher displacement handheld engines. The marine SI rule took effect with 1998 or 1999 engines, depending upon their usage, and involves a corporate average standard which tightens each year through 2006. (The marine SI rule does not apply to sterndrive or inboard engines. We expect to issue a proposal to regulate such engines in the coming year). Under the regulations, both small SI engine and marine SI engine manufacturers are prohibited from introducing into commerce any engine not covered by a EPA-issued certificate of conformity (40 CFR 90.1003(a)(1)(I); 40 CFR 91.1103(a)(1)(I)). The rules also prohibit equipment and vessel manufacturers from introducing new nonroad equipment and vessels into commerce unless the engine in the equipment or vessel is certified to comply with the applicable nonroad emission requirements (40 CFR 90.1003(a)(5); 40 CFR 91.1103(a)(5)).[2] We added provisions to allow engine manufacturers to produce replacement engines that were not certified to currently applicable standards to each of the two rules described above by a direct final rule issued August 7, 1997 (62 FR 42638).

B. What are the Basic Provisions of This Final Rule?

The following section provides an overview of the Phase 2 provisions being finalized with today's action as well as the amendments to the current small SI engine and marine SI

[2] The regulations also prohibit, in the case of any person, the importation of uncertified small SI engines and marine SI engines manufactured after the applicable implementation date for the engine. The regulations also prohibit the importation of equipment containing small SI engines unless the engine is covered by a certificate of conformity. (40 CFR 90.1003(a)(1)(ii) and 40 CFR 91.1103(a)(1)(ii)).

engine programs. Additional detail explaining the program as well as discussion of information and analyses which led to the selection of these requirements is contained in subsequent sections. Summaries of comments we received on the July 1999 SNPRM (for the Phase 2 program) and the February 1999 NPRM (for the amendments) and detailed responses to those comments are contained in a separate document included in the dockets for today's final rule.

Consistent with the Phase 1 regulations for small SI engines, today's action and the recently finalized Phase 2 program for nonhandheld engines distinguish between engines used in handheld equipment and those used in nonhandheld equipment. In today's action, we are adopting Phase 2 emission standards for distinct engine size categories referred to as "engine classes" within the handheld engine equipment designation. Table 1 summarizes the HC+NOx emission standards for Class III, Class IV, and Class V handheld engines and when these standards are scheduled to take effect under this final rule. Table 2 summarizes the CO standards and the effective dates of the CO standards. In response to comments submitted on the July 1999 SNPRM, the standards and implementation schedule contained in today's final rule for handheld engines reflect a four year phase in schedule instead of a five year phase in schedule as proposed in the SNPRM.

Table 1

Phase 2 HC+NOx Emission Standards for Handheld Engines

Engine Class	HC+NOx Standards (g/kW-hr) by Model Year					
	2002	2003	2004	2005	2006	2007 and later
Class III	238	175	113	50	50	50
Class IV	196	148	99	50	50	50
Class V	---	---	143	119	96	72

Table 2

Phase 2 CO Emission Standards for Handheld Engines

Engine Class	CO Standard (g/kW-hr)	Effective Model Year
Class III	805	2002
Class IV	805	2002
Class V	603	2004

When fully phased in, these Phase 2 standards are expected to result in an estimated 70 percent annual reduction in combined HC+NOx emissions from small SI handheld engines compared to the Phase 1 emission requirements for such engines. Due to the use of improved technology, CO emissions are also expected to decrease below Phase 1 levels.

To help engine manufacturers meet the HC+NOx standards noted in Table 1, we are adopting provisions to include Phase 2 handheld engines in the certification averaging, banking

and trading (ABT) program. The combination of the declining Phase 2 handheld standards and the ABT program should allow manufacturers to make an orderly and efficiently transition from their existing Phase 1 engine designs and technologies to those necessary to meet the new Phase 2 requirements and should provide an incentive for the early introduction of clean engines. We believe that the ABT program is an integral part of the Phase 2 HC+NOx standards being adopted for Classes III, IV, and V. (As noted later, the ABT program does not apply to CO emissions.)

As noted earlier, we are adopting provisions that will add two new classes of small SI nonhandheld engines. Class I-A will cover engines with displacement less than 66cc that are installed in nonhandheld equipment. Class I-B will cover engines equal to or greater than 66cc but less than 100cc that are installed in nonhandheld equipment. Table 3 contains the HC+NOx standards and CO standards we are adopting for Class I-A and Class I-B engines. The standards contained in today's final rule for Class I-A and Class I-B nonhandheld engines are the same as we proposed in the July 1999 SNPRM. Implementation of the standards for the new classes of Class I-A and Class I-B engines will begin with the 2001 model year. Class I-A and Class I-B engines will also be allowed to participate in the ABT program for small SI engines.

Table 3

Phase 2 Emission Standards for Class I-A and Class I-B Engines

Engine Class	HC+NOx Standard (g/kW-hr)	CO Standard (g/kW-hr)	Effective Model Year
Class I-A	50	610	2001
Class I-B	40	610	2001

With today's action, we are also finalizing the provision which will allow manufacturers the option of certifying engines greater than 19 kW and less than or equal to one liter in displacement to the small SI engine Phase 2 regulations beginning with the 2001 model year. Because the power rating of such engines is above 19 kW, we do not currently regulate such engines and therefore the engines are not required to comply with any previously existing emission standards at the federal level. We issued a Notice of Proposed Finding on February 8, 1999, which announced our intent to propose regulations for "large nonroad SI engines" and we are currently developing a NPRM for large nonroad SI engines to be issued in late 2000 (see 64 FR 6008). We expect this proposal would be consistent with actions taken for these engines in today's rule.

For the Phase 2 handheld engine program, we are retaining the current test procedure used by manufacturers to certify engines with one modification. The weighting of the two different test modes used for calculating the certification emission levels for handheld engines is being changed to 85 percent wide open throttle and 15 percent idle. (The weighting of the modes for the Phase 1 program is 90 percent wide open throttle and 10 percent idle.)

The Phase 2 standards and the compliance program elements being adopted today require engine manufacturers to consider expected in-use deterioration. In contrast to the Phase 1 program which only regulates the emission performance of engines when new, the Phase 2 program will require manufacturers to account for expected deterioration in emission performance as an engine is used. Manufacturers will be required to evaluate the emission deterioration performance of their engine designs and certify their designs to meet the standards after factoring in the anticipated emission deterioration of a typical in-use engine over its useful life.

Under today's action, an engine manufacturer will select from one of three different useful life categories based on the type of engine and equipment in which the engine is installed. Handheld engine manufacturers can certify for a useful life period of 50, 125, or 300 hours based on design features and the intended use of the application. For Class I-A engines, we are also adopting useful life periods of 50, 125, and 300 hours. For Class I-B engines, we are adopting useful life periods of 125, 250, or 500 hours.

Under the Phase 2 certification program being adopted today, manufacturers are allowed to determine an appropriate methodology for accumulating hours of operation to "age" an engine in a manner which duplicates the same type of wear and other deterioration mechanisms expected under typical consumer use which could affect emission performance. We expect laboratory-based bench testing will often be used to conduct this aging operation because it can save time and perhaps money, but actual in-use operation (e.g., trimming grass) will also be allowed.

Emission tests will be conducted when the engine is new and when it has finished accumulating the equivalent of its useful life. The engine will have to pass the applicable standards both when it is new and at the end of its designated useful life to qualify for certification. Additionally, the new engine and fully aged engine emission test levels will be compared to determine the expected deterioration in emission performance for engines of this design.

We are also adopting a Production Line Testing (PLT) program for Phase 2 engines covered by today's action. The PLT program is explained in more detail in a following section but, briefly, the intent is to require a sampling of production line engines to be tested for emission performance to assure that the design intent as certified prior to production has been successfully transferred by the engine manufacturer to mass production. The volume of PLT testing required by the manufacturer would depend on how close the test results from the initial engines tested are to the applicable standards. If the initial test results indicate the design is well below the applicable standards, few engines will need to be tested. For those designs where the test results indicate emission levels are very close to the applicable standards, additional tests will be required to make sure the design is being produced with acceptable emission performance.

While the newly adopted Phase 2 compliance program will not require manufacturers to conduct any in-use testing to verify continued satisfactory emission performance in the hands of typical consumers, we are adopting an optional program for such in-use testing with today's action. We believe it is important for manufacturers to conduct in-use testing to monitor the success of their designs and to factor back into their design and/or production process any

information suggesting emission problems in the field. While not mandating such a program, today's action will encourage such testing by allowing a manufacturer to avoid the cost of the PLT program for a portion of its product line by instead supplying data from in-use engines. Under this voluntary in-use testing program, up to twenty percent of the engine families certified in a year by a manufacturer can be designated for in-use testing. For these families, no PLT testing will be required for two model years including that model year. Instead, the manufacturer will select a minimum of three engines off the assembly line or from another source of new engines and emissions test them when aged to at least 75 percent of their useful life under typical in-use operating conditions for this engine. The information related to this in-use testing program will need to be shared with us. If any information derived from this program indicates a possible substantial in-use emission performance problem, we anticipate the manufacturer will seek to determine the nature of the emission performance problem and what corrective actions might be appropriate. We plan to offer our assistance in analysis of the reasons for unexpectedly high in-use emission performance and what actions might be appropriate for reducing these high emissions.

Separate from the program allowing manufacturers to perform voluntary in-use testing, we could choose to conduct our own in-use compliance program, either generally or on a case-by-case basis. If we determine that such action is appropriate, we expect that we will perform our own in-use testing to determine whether a specific class or category of engines is complying with applicable standards in use.

All of the general provisions of the Phase 2 compliance program contained in today's action have been adopted as part of California's compliance program for these classes of small engines.[3] Importantly, the testing and data requirements, engine family descriptors, compliance statements and similar testing and information requirements of these federal Phase 2 handheld regulations are, to the best of our knowledge, the same general compliance program requirements adopted by the California ARB. This will be advantageous to manufacturers marketing the same product designs in California as in the other states, as they would need to prepare only one set of certification application information, supplying one copy to the California ARB for certification in the State of California and one copy to us for federal certification. This similar treatment under the regulations also extends to the PLT program and is also likely to extend to the optional in-use testing program, such that any test data and related information developed for the federal regulatory requirements being adopted today should also satisfy the requirements of the California ARB.

In addition to the Phase 2 provisions highlighted above, today's action includes special provisions for small volume engine manufacturers, small volume engine families produced by other engine manufacturers, small volume equipment manufacturers who rely on other manufacturers to supply them with these small SI handheld engines, and small volume equipment models. These handheld small volume provisions should help to lessen the

[3] While the voluntary in-use test program has not been codified in the California ARB Tier 2 rules for these engines, we have discussed the program with the California ARB. The California ARB supports our voluntary in-use test program provisions as contained in today's action.

demonstration requirements and smooth the transition to these Phase 2 requirements. This is especially important for small volume applications because the eligible manufacturers involved may not have the resources to ensure that engines complying with the Phase 2 standards will be available within the time frames otherwise envisioned under these regulations. Without these provisions, we believe the economic impacts to small volume manufacturers would be increased and the possibility of reduced product offering would be greater, especially for those products intended to serve niche markets which satisfy special needs.

Finally, today's action includes amendments to the existing rules for small SI nonroad engines and marine SI engines. First, for small SI engines, we are revising the definition of handheld engine by removing a restriction that may prevent equipment manufacturers from using cleaner, but heavier, engines in certain handheld lawn and garden equipment. Second, we are modifying the applicability of the rule so that a small number of engines used in model aircraft can be considered "recreational" and excluded from coverage. Third, we are adopting provisions that would add phase-in flexibility to reduce the regulatory impact on a few very small manufacturers of marine engines. Lastly, the amendments include provisions for both the small SI engine and marine SI rules that closes a potential loophole that could have led to the abuse of special provisions that exist to permit the sale of uncertified engines for replacement purposes.

II. Detailed Description of This Final Rule

The following sections provide additional detail on the provisions of the today's action

outlined above.

A. What are the Emission Standards and Other Related Provisions?

1. Class Structure

With today's action we are retaining the same basic class structure for handheld engines as implemented in the Phase 1 regulations. Phase 2 handheld engines will continue to be categorized as either Class III, Class IV, or Class V engines based on the displacement of the engine.

As noted above, we are adopting provisions for two new classes of nonhandheld engines in today's action. The Phase 1 program separated the small engine category into those intended for use in equipment typically carried by the operator during its use, such as chain saws or string trimmers, referred to as handheld equipment, and those engines normally used in equipment which is not carried by the operator, such as lawnmowers and generators, referred to as nonhandheld equipment. Under the Phase 1 program, there are two classes of nonhandheld engines, Class I and Class II. Class I includes all nonhandheld engines with displacements below 225cc. The July 1999 SNPRM contained a proposal to include two new classes of nonhandheld engines below 100cc. The July 1999 SNPRM provisions were based on comments received from the Engine Manufacturers Association (EMA) and several individual engine manufacturers on the January 1998 NPRM. EMA and engine manufacturers requested the creation of smaller

displacement classes of nonhandheld engines for several reasons including the need to fill a void in the equipment market left by products that would no longer be able to utilize 2-stroke engines if the Phase 2 Class I standard as proposed at that time was adopted. Manufacturers asserted the infeasibility of the Phase 2 Class I standard proposed at that time for the smallest engines in the class because of the increased difficulty in reducing emissions with small displacement engines.

The comments we received regarding Class I-A and Class I-B engines generally supported the addition of the new classes of nonhandheld engines. (Additional discussion of the actual standards being adopted for Class I-A and Class I-B engines is included in the following section of today's action.) Based on the fact that it is generally more difficult for smaller displacement engines to meet the same emission standards as larger displacement engines, we continue to believe that the recently adopted Phase 2 Class I standard which is technically feasible and economically viable for the existing larger displacement 4-stroke engines in Class I (which have displacements typically above 125cc and are used primarily in lawnmowers), could be too costly for manufacturers to be achievable for not currently marketed smaller displacement engines that equipment manufacturers assert they need to use in applications requiring the use of much smaller displacement nonhandheld engines. Therefore, we are adopting the proposed provisions to subdivide the Class I engine category by adding two new nonhandheld engine classes and redesignating the span of displacements covered by Class I. Under today's action, Class I-A will include nonhandheld engines below 66cc, Class I-B will include nonhandheld engines equal to or greater than 66cc but less than 100cc, and Class I will cover engines equal to or greater than 100cc but less than 225cc.

In the July 1999 SNPRM, we requested comment regarding the possibility that if the proposed Class I-A and I-B standards were adopted, manufacturers might shift significant production from Class I to the smaller displacement engines. We also requested comment on the potential for 2-stroke engines to meet the proposed Class I-A and I-B standards and the potential for such engines to be used in existing nonhandheld applications such as mowers. We noted that if such a change in the market were to occur, the benefits of the recently finalized Phase 2 program for Class I engines which anticipates a turnover to clean 4-stroke OHV technology would be seriously compromised. Based on the comments submitted on the proposed Class I-A and Class I-B provisions, we do not believe that it is likely manufacturers would shift significant production from Class I to the smaller displacement engines. Neither do we believe that manufacturers could design and market to any appreciable extent significant numbers of 2-stroke engines in nonhandheld applications.

In response to a request from manufacturers, we included in the July 1999 SNPRM an option for manufacturers to certify engines above 19 kW with displacements less than or equal to one liter to the small SI standards. As noted earlier, such engines are currently unregulated at the federal level. We received comments from one trade group and one manufacturer supporting the proposed provisions. Therefore, we are adopting the provisions as proposed that allow manufacturers the option of certifying engines above 19 kW and less than or equal to one liter in displacement to the small SI engine program beginning with the 2001 model year. It should be noted that if a manufacturer chooses to certify such engines under the small engine program, the engines will need to be certified to the Phase 2 requirements for the appropriate class of

nonhandheld engines, which is expected to be the Class II requirements (i.e., engines above 225cc in displacement), for a useful life period of 1,000 hours. We recently issued a Notice of Proposed Finding (see 64 FR 6008) which announced our intent to propose regulations for "large nonroad SI engines" (which include these greater than 19 kW but less than one liter engines). We expect to issue a NPRM for large nonroad SI engines in 2000, and to propose that engines greater than 19 kW and less than one liter in displacement meet small SI nonroad engine requirements. If, however, we do not propose and/or adopt such a requirement for these engines as part of the large SI nonroad program, we would expect to consider reasonable approaches to minimizing disruption, as appropriate, to the affected industry. Such approaches would be addressed in the rulemaking process for large SI nonroad engines.

2. Emission Standards and Implementation Schedule

In response to comments submitted on the July 1999 SNPRM, with today's action we are adopting a slightly different schedule of Phase 2 HC+NOx standards compared to those proposed in the SNPRM. (The phase-in standards are changing from the proposal because we are adopting a four year phase-in schedule with today's action instead of the proposed five year phase-in schedule.) The CO standards being adopted with today's action are the same as proposed in the July 1999 SNPRM. The new Phase 2 standards will begin to take effect with the 2002 model year for Classes III and IV and the 2004 model year for Class V. For HC+NOx, engine manufacturers will be required to meet a declining standard that varies by engine class. As proposed in the July 1999 SNPRM, engine manufacturers will be required to meet a HC+NOx

standard of 50 g/kW-hr for Classes III and IV and 72 g/kW-hr for Class V SNPRM at the end of the phase in. However, the fleet average standards that a manufacturer is required to meet during the phase-in period differ from those proposed in response to comments that have persuaded EPA that a faster phase-in is more appropriate under the Act. Table 1 and Table 2, presented earlier, contain the full schedule of Phase 2 HC+NOx standards and CO standards, respectively, being adopted today for handheld engines by model year. As described in section II.B., engine manufacturers will be able to use the averaging, banking and trading program to demonstrate compliance with the Phase 2 HC+NOx standards on average. Engine manufacturers will be required to meet the Class III and Class IV CO standard beginning with the 2002 model year and the Class V CO standard beginning with the 2004 model year. Unlike the HC+NOx standards, the CO standards do not decrease over time, and the averaging, banking and trading program does not apply to the CO standards.

The Clean Air Act at section 213(a)(3) requires us to adopt standards that result in the greatest emission reductions achievable through the application of technology which the Administrator determines will be available, giving appropriate consideration to cost, lead time, noise, energy and safety factors. As a result of information now available, and due to the rapid technological advances the handheld engine industry is making in an effort to design engines which are more environmentally friendly, we have determined that the standards being adopted today are achievable during the timeframe being adopted today. Table 4 summarizes the handheld technologies we conclude are capable of meeting the newly adopted standards by engine class. Note that for the purpose of generating a cost estimate for this rule, a subset of

these available technologies were evaluated for their cost impact

Table 4

Potential Technologies for Meeting the Phase 2 Standards for Handheld Engines

Engine Class	Technologies
III	- Compression Wave Technology + low-medium efficiency Catalyst - Stratified Scavenging with Lean Combustion + medium-high efficiency Catalyst - 4-Stroke
IV	-Compression Wave Technology - Compression Wave Technology + low efficiency Catalyst - Stratified Scavenging with Lean Combustion + medium efficiency Catalyst - 4-Stroke
V	- Compression Wave Technology - 4-Stroke (on certain applications) - Stratified Scavenging with Lean Combustion

While not all of the technologies discussed above have yet been demonstrated in mass-produced production engines operated under typical in-use conditions, we are confident that these technologies will provide industry with several emission control alternatives for meeting the new Phase 2 standards. Manufacturer prototype testing, California ARB certification information, and testing that we have performed as listed in Chapter 3 of the Final Regulatory Impact Analysis (RIA) demonstrate that currently available 2-stroke and 4-stroke technologies

can achieve the newly adopted emission standards, especially if one considers catalysts are available to use along with the 2-stroke engine technologies. In addition to the technologies highlighted in today's action, we have examined though not included in our feasibility and costs analyses other promising technologies that may be available to help manufacturers meet the standards being adopted today. One of these technologies, a new engine design, referred to as DIPS, utilizes direct fuel injection and has shown promise in achieving HC emissions levels below the standards being adopted today possibly without the use of a catalyst. Another technology is a redesigned spark plug developed by Pyrotek that has been shown to achieve incremental emission HC reductions (at low cost) that could be beneficial for engines which may need slightly more reductions to meet the emission standards being adopted today. Both of these technologies are described in further detail in Chapter 3 of the Final RIA. Finally, we understand that manufacturers are developing electronic fuel injection systems which if successful, should also allow low emissions. However, we have insufficient information at this time to consider this technology in this rulemaking although it may well be available during the 2002-2007 time period during which these standards will take effect.

For 2-stroke engines, John Deere has certified a 25cc trimmer engine outfitted with the compression wave technology (also referred to as the John Deere LE engine) under the California ARB's Tier 2 program for small SI engines. The engine, which would be a Class IV engine under our classifications, was certified to a HC+NOx emissions level of 61 g/kW-hr at a useful life of 125 hours. In addition, John Deere adapted two Class V chainsaw engines and achieved HC+NOx emissions below the Class V standard of 72 g/kW-hr. Both of the chainsaw prototype

applications did have significantly lower power with the compression wave technology retrofitted to the engine. However, the revised engine designs had been developed in a very short period of time and the fuel metering system had not been optimized for either of the engines, which would explain the loss in power. We believe, however, John Deere's efforts to retrofit the compression wave technology on these two Class V engines demonstrates the potential to apply the technology to Class V applications. Other manufacturers have also certified a number of advanced 2-stroke engine designs in California to meet the California ARB's Tier 2 HC+NOx standard for model year 2000. Among these engines, Komatsu Zenoah has certified two stratified scavenging with lean combustion engine designs at 66 g/kW-hr HC+NOx at a useful life of 300 hours with a 25.4cc engine and 53 g/kW-hr HC+NOx at a useful life of 300 hours with a 33.6cc engine. Stihl has certified an engine at 66 g/kW-hr HC+NOx at a useful life of 300 hours for a 56.5cc engine (i.e., Class V under our classifications).

While neither John Deere's compression wave technology engine nor the Komatsu Zenoah stratified scavenging with lean combustion engines noted above currently meets the newly adopted emission standards alone, John Deere has informed us that perhaps 50% of their Class IV applications are expected to comply with the standards while relying on the compression wave technology only. This may be due to their expectations for further improvement to that technology and their ability to take advantage of averaging to reduce costs. Thus, the addition of a catalyst on at least some applications, along with further engine improvements should allow them to demonstrate compliance with the Phase 2 standards. Allowing for a 20% compliance margin to account for variances within production runs and less

precise manufacturing from prototype models to production runs, the target certification level in Classes III and IV is estimated to be around 40 g/kW-hr HC+NOx for the technology prototypes (i.e., certification engines) at the end of their regulatory useful lives. The required catalyst conversion efficiencies for these engines to meet the target level noted above have been estimated using information from a number of sources. Engine-out emissions (without catalyst) at the end of the useful life are taken from the California ARB's Tier 2 certification data. HC+NOx emission deterioration information for the compression wave technology is also obtained from the California ARB certification data, which states the deterioration for the compression wave technology is 1.1. HC+NOx emission deterioration information for the stratified scavenging with lean combustion is estimated from EPA test data (Docket A-96-55 Item VI-A-01) and is assumed to be 1.0. Finally, a 30% deterioration in catalyst efficiency is assumed as the catalyst goes from new to the end of the certification useful life. Using this information, it is estimated that, without improvements in engine emission performance, the new engine catalyst conversion efficiency for the 25cc compression wave technology engine would need to be approximately 50% (30 g/kW-hr HC+NOx). For the 25.4cc stratified scavenged with lean combustion engine a 57% (38 g/kW-hr HC+NOx) efficiency catalyst would be needed and for the 33.6cc stratified scavenged with lean combustion engine a 36% (19 g/kW-hr HC+NOx) efficiency catalyst would be needed, given the current level of engine-out emissions.

Concerns regarding catalyst heat management need to be addressed, especially in cases where high levels of HC+NOx need to be converted in a catalyst. However, given the fact that catalysts used on currently certified handheld engines have been shown to have conversion

efficiencies in the range cited above, the amount of lead time available to manufacturers prior to the implementation of the Phase 2 standards will be sufficient for manufacturers to implement additional engine and equipment improvements such that catalysts may be utilized on handheld engines without catalyst heat management concerns. Further, we believe that John Deere's, Ryobi's, and Echo's support of the 50 g/kW-hr standard supports the conclusion that if catalysts are used then catalyst heat issues can adequately be addressed. Although the current California standards are somewhat less stringent than the federal standards being adopted today, the fact that catalysts are being used in some of these California certified applications demonstrates that manufacturers have the ability to design equipment adequately addressing catalyst temperature issues.

We believe that the leadtime available before implementation of this rule and the period during phase-in to the final standards will allow additional improvements in engine-out emission performance. These improvements will include refinements of the fuel metering technology, improvements in combustion chamber and piston head design, and improvements in spark ignition via such devices as the Pyrotek spark plug mentioned earlier. Lastly, as the test data from the California ARB certification list shows, emissions of larger engines (as illustrated in comparison of the 25.4cc and 34cc stratified scavenged with lean combustion engines) decrease with increased engine size and therefore catalyst conversion requirements (and catalyst temperatures) will not be as high with larger Class IV engine displacements. It should be noted that for Class V (engines with displacement above 50cc), we do not believe that manufacturers will need to employ catalysts to meet the standards being adopted today, and therefore catalyst

heat management concerns should not be a concern.

Although 2-stroke engines currently dominate the handheld engine market, we have determined that 4-stroke engines have the potential to achieve a significant share of the handheld market in the future. Ryobi, one of the biggest manufacturers of handheld equipment, has commented that it intends to expand the number of 4-stroke models available under the Phase 2 program. Three manufacturers have recently certified 4-stroke engines with the California ARB for the 2000 model year Tier 2 program that are used in handheld applications. Fuji Heavy Industries has certified a 4-stroke engine at 17 g/kW-hr HC+NOx for a useful life of 125 hours with a 24.5cc engine. Komatsu Zenoah has certified a 4-stroke engine at 31 g/kW-hr HC+NOx for a useful life of 300 hours with a 26.4cc engine. Ryobi has also certified two different 4-stroke engine families at 15 g/kW-hr HC+NOx for a useful life of 50 hours and at 21 g/kW-hr HC+NOx for a useful life of 300 hours. Both of these designs are on a 26.2cc engine. All of the 4-stroke engines noted above would be expected to meet the standards adopted today without use of a catalyst.

In the July 1999 SNPRM, we requested comment on a number of items related to the standards and the technologies we considered in developing the reproposed standards. The bulk of the comments received on the July 1999 SNPRM focused on the technologies, standards and implementation schedule proposed in the SNPRM. The following paragraphs summarize the major comments received and our responses. The full set of comments and more detailed responses related to the technologies, standards and implementation schedule can be found in the

Summary and Analysis of Comments Document.

John Deere, Ryobi, and the California ARB supported the reproposed standards and suggested an additional change in the HC+NOx standard for Class V to 50 g/kW-hr. John Deere asserted that compression wave technology is available for meeting a 50 g/kW-hr HC+NOx standard in all classes. Ryobi commented that the 4-stroke engine is capable of meeting a 50 g/kW-hr HC+NOx standard in all classes. One additional engine manufacturer, Echo, supported the standards as proposed. A number of other engine manufacturers opposed the HC+NOx standards, including Husqvarna/Frigidaire Home Products (FHP), Stihl, and Tecumseh. Technical feasibility concerns regarding the technologies noted in the July 1999 SNPRM were the focus of comments from those in industry who opposed the reproposed HC+NOx emission standards. (The July 1999 SNPRM noted that technologies such as John Deere's LE engine with a catalyst, Komatsu Zenoah's stratified scavenging with lean combustion engine with a catalyst, and 4-stroke engines are all technologies which have shown or have the potential to achieve the proposed standards on all or a portion of the engines covered in this rulemaking. For Class V engines, the July 1999 SNPRM noted that catalysts would likely not be required to meet the standards.) Two handheld industry associations supported the CO standards as proposed. Several months after the close of the comment period for the July 1999 SNPRM, we received comments from the Sierra Club and from the State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) asking us to adopt more stringent standards for Class V, and to expedite the effective dates for all of the handheld standards, based on their belief that manufacturers could meet such standards on a more

accelerated schedule. We also received comments from equipment users and representatives of the forestry industry expressing concern about the potential impact of these regulations on safety, in particular a concern that chainsaws could cause a fire hazard if their exhaust systems became very hot.

With regard to John Deere's compression wave technology, we requested comments on the likelihood that cost-effective solutions can be made available over the next two to three years across the full range of handheld engines and applications. John Deere, Stihl, and Husqvarna/FHP commented on this item. While John Deere had nearly completed a successful prototype on a Class IV trimmer engine prior to the July 1999 SNPRM, it was constructing a preliminary prototype for a 70cc Class V chainsaw engine during the comment period and was able to submit a video and emission test results showing successful preliminary application of the technology to a Class V chainsaw in their comments on the July 1999 SNPRM. Stihl and Husqvarna/FHP also each submitted comments stating that they conducted individual short term studies on their interpretation of the compression wave technology on Class V and Class IV chainsaw engines, respectively. As detailed in their comments, the results of their limited studies lead Stihl and Husqvarna/FHP to believe that the technology is not feasible based on a number of issues with their chainsaw prototypes. After the close of the comment period, John Deere submitted additional feedback on the analysis performed by Stihl and Husqvarna on their respective prototypes. While John Deere did address the majority of each company's concerns listed in their reports, John Deere also acknowledged that more development time is needed in order to optimize the system for Class V applications and to determine if an additional

lubrication system will be necessary on chainsaw and similar application engines. Nevertheless, based on the fact that John Deere has been successfully developing the technology for approximately one year, and has shown us that it can in this relatively short period of time, address the majority of issues that have been raised by Stihl and Husqvarna, we have concluded that the compression wave technology holds a great deal of promise and that industry will be able to address all issues raised in the lead time provided under today's rule.

Under today's action, Class V engines have until 2004 to start certifying, and this is sufficient time for engine manufacturers to develop the compression wave technology, or stratified scavenging with lean combustion, or develop their own technology, for Class V engines. Therefore, we conclude that the issues raised by Stihl and Husqvarna regarding technological feasibility do not undermine the achievability of the Class V standards, since adequate technology will be available.

With regard to the more stringent Class V standard supported by John Deere, Ryobi, and the California ARB, we do not believe the existing information provides us with a high enough degree of certainty to determine that a tighter standard is feasible for all applications within the leadtime provided by the rule. As noted earlier, John Deere has submitted information on two Class V engines equipped with the compression wave technology. The test results show that emission levels close to the standard are currently achievable on the larger engines as well. However, as noted earlier, the redesigned engines were not fully developed to address all issues, including emissions deterioration over the longest useful life category to which Class V engines

are expected to certify. Based on John Deere's experience with applying the compression wave technology to its 25cc engine, at least in the near term, emissions will likely increase as the system is redesigned to address issues needed to make the engine production ready and deliver maximum performance. In addition, while we are optimistic that low deterioration can be demonstrated, the deterioration characteristics of the compression wave technology out to 300 hours remain unknown at this time. Due to these concerns, we cannot be as certain that Class V engines can achieve a standard of 50 g/kW-hr as is being adopted for Class III and IV engines and applications within the timeframe of implementation of the Class V standards.. Therefore, for Class V we are adopting the 72 g/kW-hr HC+NOx standard as proposed. It should be noted that the Class V standards during the phase-in period differ from those proposed because of the revised four year implementation schedule described below.

With regard to the provisions of the patent as offered by John Deere for the compression wave technology, the licensing fee printed in John Deere's literature had been claimed to be excessive by some in the industry. We therefore requested comment on the licensing fees suggested by John Deere, the impact such fees would have on competition given the cost for other technology options, and the level of the licensing fee necessary to allow this licensed technology to be a more cost effective option for other manufacturers. Manufacturers claimed that the provisions of the current licensing agreement offered by John Deere are unworkable since they include provisions that development work is the responsibility of the licensee, and any patentable ideas a manufacturer develops become the property of John Deere. One manufacturer stated that the small engine industry typically bases royalties (usually 1 to 4%) on the cost of the

component and not the cost of the equipment as John Deere has established. In addition, typical per unit profits in the consumer market are claimed by some manufacturers to be well below the minimum fee of $7.50 proposed by John Deere and, according to these manufacturers, a license fee of $7.50 would drive out competitors from the market. While the provisions of the licensing agreement currently published by John Deere may not be acceptable to other manufacturers, especially those that compete directly against John Deere in the consumer market, we are confident that future competing technologies, such as the stratified scavenging with lean combustion engine and the 4-stroke engine, will lead to lower licensing fees and perhaps licensing agreement provisions for all technologies which the licensee will find more favorable. Therefore, we do not view the initial licensing fee proposal offered by John Deere to be an impediment to the availability of LE technology for purposes of achieving the standards adopted today. The fact that no manufacturer has agreed to pay the license fee as proposed by John Deere suggests that it is too high and will necessarily have to be lowered. However, we do not know what the ultimate level of the licensing fee will be and therefore, for cost purposes, we have assumed the levels proposed by John Deere. Lower license fees would obviously result in lower overall costs of this technology and reduced impacts on consumer prices.

With respect to other low emission technologies, we requested information on the idea that 4-stroke engines could be used for the majority of Class IV applications. The July 1999 SNPRM also stated that it is likely the 4-stroke would be applicable to the smallest of Class V engines. We received comments questioning the applicability of 4-stroke engines in all handheld applications and expressing concerns about the heavy weight of the 4-stroke engine design, its

slow acceleration, lower power, decreased durability due to the increased number of parts compared to 2-stroke engines, and the need for new manufacturing facilities for 4-stroke engines. Additional comments also questioned whether 4-stroke engines can be useful to the commercial user. Other comments supported use of 4-stroke engines and noted that they are currently used to power trimmers and brushcutters and weigh little more than comparable 2-stroke engines. In addition, commenters noted that 4-strokes provide more power in the lower engine speed range and no oil/fuel mixing is required.

Considering all of these comments and the fact that manufacturers are already certifying low-emitting 4-stroke engines for use in handheld applications under the California ARB's Tier 2 program, we have concluded that the 4-stroke engine has a significant place among the technologies capable of meeting the finalized standards. However, 4-stroke engines may not be the manufacturer's preferred choice for all engine displacements or equipment applications. While the 4-stroke is currently being applied in Class IV applications, such as trimmers, it may be a less desirable solution for Class III due to the cost of developing whole new 4-stroke engines for the few engine families in this class. (Class III applications tend to be the lowest priced consumer products.) The low volumes of the majority of Class III engine family sales may make the 4-stroke engine a less cost effective solution than other technologies unless the engine block and components can be adapted from a larger Class IV engine production line. Some manufacturers may find the cost of the 4-stroke technology on Class III equipment to be too large compared to the retail price, especially given the consumer market focus for these engines. For Class V engines we are confident that the 4-stroke engine design can be adapted to equipment in

the lower displacement Class V engines. However, 4-stroke engines have not been demonstrated in the larger Class V applications where manufacturers have especially expressed concerns over potential increased weight, ergonomic problems, and the need to assure sufficient lubrication. To our knowledge, the manufacturers who currently market large displacement Class V equipment in the United States have no experience in designing and producing 4-stroke engines for handheld equipment, adding to their difficulty in applying this technology. Therefore, we conclude that 4-stroke technology will be cost-effective and widely available for Class IV engines, will be available but possibly less cost-effective for Class III engines, and will be available for at least the lower displacement Class V engines under the standards adopted today. However, we cannot similarly predict the applicability of 4-stroke technology for the largest displacement Class V engines within the time constraints for implementation of Class V standards.

For stratified scavenging with lean combustion engine designs, comments were received asserting the inability of current designs with a catalyst to meet the standards proposed in the July 1999 SNPRM. As suggested evidence that lean combustion designs could not meet the proposed standards, one manufacturer stated that Kawasaki recently introduced a stratified scavenged 2-stroke engine with a catalyst that obtains 46 g/hp-hr (61.3 g/kW-hr) HC+NOx. Another manufacturer stated that the suggestion that stratified scavenging technology is a feasible way to achieve the proposed standards for Classes III and IV is unfounded. It cited the results of our recent testing that showed a prototype Komatsu Zenoah engine exceeded the U. S. Department of Agriculture's Forest Service (USFS) temperature requirements even without a catalyst. Komatsu

Zenoah did not submit any comments on the July 1999 SNPRM. However, Komatsu Zenoah has developed 25.4cc and 33.6cc versions of this technology and certified them with the California ARB under the Tier 2 program at HC+NOx levels of 66 g/kW-hr for a useful life of 300 hours and 53 g/kW-hr for a useful life of 300 hours, respectively. (They are also certified to meet the USFS temperature requirements.) Neither of these engines is equipped with a catalyst. While our recent testing of their prototype trimmer did reveal concerns of high surface temperature of the exhaust housing, observation of the current muffler/housing arrangement revealed that the design was not optimized and that there was room for improvement in its design. While the California ARB certification emissions data shows that current engines equipped with stratified scavenging with lean combustion are emitting at levels above the 50 g/kW-hr HC+NOx standard adopted today for Class III and IV, our emission test data on Komatsu Zenoah's 25cc stratified scavenging with lean combustion engine with one medium/high and one medium efficiency catalyst ranged from 28 to 39 g/kW-hr HC+NOx, respectively. Using the data associated with the catalyst that yielded 28 g/kW-hr, and assuming a 30% deterioration of the catalyst and 10% deterioration of the engine, the resultant emission level in-use is estimated to be 48 g/kW-hr. While this result shows compliance with the standards adopted in this rulemaking can already be achieved with this technology, it is likely that emissions will need to be lowered even more either through engine improvements or better catalyst designs to allow for a compliance margin with production engines. Compliance with the USFS temperature requirements may also need to be further addressed. However, several years still remain before full compliance with these standards is required and we are confident that further development will bring this technology within reasonable emissions for use in meeting these standards. In addition, our testing was

conducted on the 25.4cc engine, and application of this technology to larger displacement engines will result in lower emissions. This is seen in the California ARB certification results where emissions on the 33.6cc engine are lower than the emission on the 25.4cc engine. Therefore, we conclude that stratified scavenging with lean combustion plus a catalyst will be an available technology for meeting the Class IV standards.

In regard to application of the stratified scavenging with lean combustion technology to Class V engines, we expect that the decrease in emissions with this technology in larger engines, as was shown in the comparison of the 25.4cc to the 33.6cc engines, to continue due to the favorable surface to volume ratios in larger displacement engines. This will be beneficial because catalysts should not need to be utilized on Class V engines and the degree of enleanment can be decreased and therefore provide the amount of lubrication needed in high speed applications, such as chainsaws. Therefore, we believe the technology will also be available for Class V engines under the standards adopted today. We conclude that the stratified scavenging with lean combustion technology should be available for Class III engines as well, but manufacturers will need to address the unfavorable surface to volume ratios in the smallest engines which tend to result in higher g/kW-hr emission levels, which suggest the need for higher efficiency catalysts.

We requested comment on the status of catalyst technology development for handheld engine applications and the likelihood that catalysts will be able to be applied to the full range of handheld engine applications to meet the proposed standards and appropriate safety

requirements. Three engine manufacturers commented on catalysts, one of which has three catalyst equipped trimmers in the marketplace, and one catalyst industry trade organization commented. Two manufacturers commented that heat dissipation is an important issue and claimed that meeting the USFS and UL-82 requirements will be difficult on all engine applications. Of particular concern are equipment such as chainsaws where the ability to redesign the engine housing is limited due to weight and power issues. A number of parties related to the timber industry have also submitted comments regarding their concern over potential forest fires with the use of catalysts on Class V commercial equipment. In regard to the application of catalysts in Classes III and IV, a variety of catalyst substrates exist in the marketplace today, including the traditional honeycomb substrate, a plate substrate (as currently used in several trimmer applications), and a circular wire mesh substrate. Some catalyst designs are able to achieve higher conversion percentage than others based on the available surface area of the catalyst. Data from our testing of two engines with low engine-out emissions retrofitted with catalysts (a Komatsu Zenoah stratified scavenging with lean combustion engine retrofitted with a flat plat and honeycomb catalyst, and a John Deere compression wave technology engine retrofitted with a prototype metallic sponge catalyst) have shown catalyst conversion efficiencies of 45% or higher.

The main concern raised by manufacturers with the use of catalysts is safety and compliance with the USFS temperature requirements. Higher conversion efficiencies of the catalyst and higher exhaust flow rate (which tends to increase with engine size) both can result in higher catalyst and exhaust gas temperatures. The needed conversion efficiency of the catalyst

and available cooling are factors that need to be addressed in order to successfully apply catalysts to small engines. While catalyst and muffler designs can influence the conversion efficiency, the ability to cool the muffler is largely dependent on the application. Leaf blowers can blow air past the muffler, and thereby can achieve a high degree of cooling. Trimmers typically have ample available space around the muffler and therefore can be designed to handle a certain amount of additional cooling by extending the muffler housing out beyond current equipment designs. (It should be noted that there are a number of such handheld applications currently certified, both federally and with the California ARB, that employ catalysts and also comply with the USFS temperature requirements.) Chainsaws on the other hand have compact packaging requirements and therefore have less flexibility in being able to handle increased amounts of cooling.

The power of an engine will influence the amount of heat that is generated in a catalyst. The general trend is that while larger engines produce more power, they also have larger surface to volume ratios which typically means lower engine out emissions (on a g/kW-hr basis), therefore decreasing the needed efficiency of a catalyst to obtain a given emission standard in g/kW-hr. Therefore, in regards to various engine classes and applications, we conclude that because the large majority of Class III engines are trimmers, they have the capability to easily incorporate a low- to medium-efficiency catalyst and that any additional heat can be managed by muffler and muffler housing redesign. Class IV incorporates a large range of engine sizes and applications from trimmers to chainsaws. The low emitting 2-stroke engine technologies that will be available for these engines reveal that, except in the case of 4-stroke engines, a catalyst may be needed to certify to the emission standards being adopted today. The major sales

application in Class IV is trimmers and, as with Class III, this application will be able to incorporate a fair degree of cooling with muffler and muffler housing redesign. Blowers will also be able to incorporate a catalyst with sufficient ability to achieve a high degree of cooling. Chainsaws using Class IV engines will be limited in the degree of catalyst conversion based on the tight packaging. However, such applications should still be able to meet the standards through controlling engine out emissions and the use of a catalyst. Additionally, averaging, banking and trading gives the manufacturer additional flexibility. Averaging, banking and trading can assist a manufacturer who may have Class IV chainsaws, or other more difficult cooling applications, in need of emission reduction by allowing the manufacturer to, for example, produce a chainsaw without a catalyst (thereby forgoing the cost and lead time associated with catalyst and cooling redesign) and, if emitting above the standard, offset these excess emissions with credits from lower emitting trimmers and blowers equipped with catalysts. With regard to Class IV 4-stroke engines, based on the certification data submitted by manufacturers to the California ARB, we believe that such engines will not require the use of a catalyst to meet the standards being adopted today and therefore will not have any heat issues that need to be addressed. Finally, with regard to Class V engines, the standards being adopted today have been set at levels that are not expected to require the use of catalysts. Therefore, Class V applications should not have any catalyst heat issues that need to be addressed.

In the July 1999 SNPRM, we requested comment on the appropriateness of the proposed two year delay for Class V engines. We received comments on the phase-in schedule for the Phase 2 standards for all classes from two manufacturers (with relatively small number of engine

families) recommending a shorter implementation schedule of one year or three years beginning in 2002 for all classes. The California ARB also requested a more expeditious timeline, recommending nationwide phase in of the standards within five years after the implementation of California's Tier 2 standard which took effect January 1, 2000. Sierra Club and STAPPA/ALAPCO also asserted that the standards can be met by all engines earlier than we proposed. One additional manufacturer (with a relatively large number of engine families) indicated that the timeline is not long enough to develop new technologies for the 50 g/kW-hr and 72 g/kW-hr standards.

As noted earlier, in response to comments submitted on the July 1999 SNPRM, with today's action we are adopting a shorter phase in schedule than we proposed in the SNPRM. We are finalizing a four year implementation schedule instead the five year schedule proposed in the July 1999 SNPRM. Each manufacturer's position with regard to implementing new technologies is unique. While some manufacturers have a small number of families, or have sales heavily dominated by one or two large engine families, other manufacturers have many families and do not have sales dominated by any specific engine family. Therefore, in determining the appropriate implementation schedule, we must balance the need for those manufacturers which have large numbers of families to have adequate time to address all of their families against the environmental benefit of achieving emission reductions as soon as possible. Based on the number of families currently certified by small SI engine manufacturers, we have determined that a four year implementation schedule of the Phase 2 standards is feasible, especially when taking into consideration the benefits of the averaging, banking, and trading program as well as the

flexibilities provided for small volume engine manufacturers and small volume engine families. Some commenters requested us to adopt an even more aggressive schedule than a four year phase-in. However, we believe the leadtime before the standards are scheduled to take effect is appropriate. The HC+NOx standards being adopted today for Class III and Class IV are more stringent than the California ARB's HC+NOx standards for these engines (i.e., 72 g/kW-hr for engines 0-65cc with the exception of exempted applications), on which industry had been focusing and developing technologies over the past few years, and will necessitate additional effort and time to assure compliance. Additionally, these will be the first low emission standards to apply to many of the Class V engine families which are used in certain farm and construction equipment applications and are exempted from meeting the California ARB standards. In addition, we believe that industry will benefit from additional lead time since in the near term they will be finishing development of products for the California market that meet the California ARB Tier 2 emission standards for small SI engines. Furthermore, we believe the schedule of standards being adopted today will allow manufacturers to sell their engines designed to meet the California ARB Tier 2 standards nationwide for a number of years, recouping the investments made for such designs, while redesigning their product offerings to meet the proposed HC+NOx standards on average. Finally, because most of the Class V engines are exempt from the California ARB Tier 2 requirements, and because the manufacturers of most Class V engines also have significant numbers of Class IV engines to redesign, we are retaining the delayed implementation schedule for Class V engines as proposed, as modified to accommodate a four year phase-in period.

In addition to the standards contained in the July 1999 SNPRM, we requested comments on the costs, feasibility, and other effects of complying nationwide with a 72 g/kW-hr HC+NOx standard for all three classes of handheld engines. Specific areas on which we requested comment included the engine designs and technologies that would be used to comply with a 72 g/kW-hr HC+NOx standard, the cost of adopting such technologies (both relative to engines currently certified under the Phase 1 program and as an extension of production of California compliant engines), and the potential for such Class III and Class IV engines to be modified to meet a 50 g/kW-hr HC+NOx standard. We also requested comment on an alternative set of standards (72 g/kW-hr for Classes III and IV and 87 g/kW-hr for Class V) supported by a number of engine manufacturers in previous discussions with us. In response to these requests, Husqvarna/FHP and Stihl submitted comments supporting the standards of 72 g/kW-hr for Classes III and IV and 87 g/kW-hr for Class V noting that technologies they were selecting to meet those levels for purposes of meeting the California ARB standards would not be able to be modified to meet the reproposed standards of 50 g/kW-hr for Classes III and IV and 72 g/kW-hr for Class V. Husqvarna/FHP also submitted a study performed by National Economic Research Associates (NERA) examining the cost effectiveness of the standards supported by Husqvarna/FHP (relative to the Phase 1 standards) and the cost effectiveness of the standards contained in the July 1999 SNPRM (relative to the standards supported by Husqvarna/FHP). The results of the NERA study suggested that the cost effectiveness of the standards supported by Husqvarna/FHP relative to Phase 1 were significantly lower than the cost effectiveness of the reproposed standards (relative to the standards supported by Husqvarna/FHP). For more discussion of this study, including our response, see section III.B. below.

We note that in the course of this rulemaking we have proposed and considered a variety of alternative approaches to the Phase 2 handheld program, and that our thinking has evolved in parallel with the industry's recent and rapid technological development. In many respects, our developing rule would become more stringent with each proposed approach, but in many others it would be come less so. For example, our March 1997 ANPRM and our January 1998 NPRM reflected significantly less stringent proposed standards that would phase in according to production percentages, with all three handheld classes having to meet the final standards by 2005. Under that alternative approach, there would have been a mandatory in-use testing program, and no ABT program. Under the ANPRM, there were no flexibility provisions under consideration, and we would have committed to conducting a technology review for possibly more stringent Phase 3 standards by 2002. Under the NPRM, the proposed flexibility provisions would have applied much more narrowly for "small volume" engine families, equipment manufacturers, and equipment models.

However, as some manufacturers' technical options for reducing emissions from handheld engines rapidly and dramatically increased over the rulemaking, thereby increasing the amount of emissions reduction achievable from handheld engines in general, we developed additional alternatives and refined and/or eliminated earlier considered alternatives. This was driven by Clean Air Act section 213(a)(3)'s requirement that our rule achieve the greatest degree of emissions reduction achievable through the application of technology that we determine will be available within the lead time provided by the program, and by our developing understanding of what kind of program would be needed in order to ensure those emissions reductions are obtained. For example,

we now know that the initially considered standards in the ANPRM and NPRM are not sufficiently stringent to meet the requirements of the Act, as they were premised on a much more limited set of technological options than we now know will be available.

Similarly, while some manufacturers have continued to advocate the standards of 72/72/87 g/kW-hr for Classes III-V that we were considering in late 1998, based on the continuing development of clean technology by other manufacturers we have determined that such standards would also fall short of meeting section 213(a)(3)'s requirements, in that they would result in losing approximately 13 percent of the emissions reduction achieved by the final standards using technology we have determined will be available and would not prompt all manufacturers to shift to these more innovative and cleaner engine technologies. This is because standards of 72/72/87 g/kW-hr could be met, indefinitely, without having to convert to the available technology options that support our final standards, and the substantial emission reduction benefits of converting to those technologies would be lost. In order to adopt the 72/72/87 g/kW-hr standards that these particular manufacturers support, we would have to conclude that the technologies underlying standards of 50/50/72 g/kW-hr will not be available in the lead time provided by the rule considering costs, safety, energy, and noise impacts, even in the face of evidence supplied by other manufacturers that these technologies and the more stringent standards are achievable. Since we do not believe we could validly reach such a conclusion and still meet the requirements of the Clean Air Act, we must eliminate the manufacturer-supported standard set of 72/72/87 g/kW-hr as a potential alternative that achieves the objectives of the rule.

While it may be true that the technologies certain manufacturers have been developing to meet the California ARB's Tier 2 standards will not be capable of meeting the tighter standards being adopted today, we have concluded that the standards being adopted today are the most appropriate standards given the requirements of section 213(a)(3) of the Clean Air Act, which requires our standards for nonroad engines and vehicles to achieve the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available, giving appropriate consideration to cost, lead time, noise, energy and safety factors. This statutory requirement is a technology-forcing provision that reflects Congress' intent that our standards encourage manufacturers to shift their production to more innovative, environmentally friendly technologies. It does not mean that our standards should be able to be met by all currently used technologies or preclude our standards from rendering less innovative and environmentally beneficial technologies obsolete. In addition, as described later in section III.B., the cost effectiveness of the adopted standards (relative to the currently applicable Phase 1 standards) is in the range of other nonroad programs we have adopted in recent years. It should also be noted that manufacturers who have invested in technologies not capable of meeting the Phase 2 standards being adopted today, but capable of meeting the slightly less stringent California ARB HC+NOx standard of 72 g/kW-hr, will still be able to certify such technologies under the Phase 2 program and earn credits in the ABT program during the transition years. Such credits will help them as they transition their entire selection of engines to meet the Phase 2 standards being adopted today. Manufacturers who have not yet developed compliant technologies can learn from the technologies already developed and/or expand the application of these technologies to their own production lines.

With regard to emissions of particulate matter (PM), the July 1999 SNPRM did not propose any standards. Nor did the SNPRM take any position regarding whether such standards would be appropriate. However, we requested information on PM emissions from handheld engines and the need for PM standards for small SI nonroad engines under section 213(a)(4) of the Clean Air Act. Two industry associations commented that they did not support establishing PM limits. The California ARB stated it recommend the study of PM and toxics from handheld engines and that a study include the classification and ranking of the toxicity of emissions from various 2-stroke designs compared to diesel PM emissions. We are not prepared to establish PM standards under section 213(a)(4) of the Clean Air Act at this time. However, we have agreed with other parties that a PM and hazardous air pollutant (HAP) test program should be conducted (see 62 FR 14746). The Portable Power Equipment Manufacturers Association (PPEMA), in cooperation with us, has agreed to conduct a test program to evaluate and quantify emissions of PM and HAP including, but not limited to, formaldehyde, acetaldehyde, benzene, toluene, and 1,3 butadiene. We anticipate that testing will be conducted on Phase 2 technology handheld engines, with a sufficient magnitude of engines tested to represent the range of new basic technologies used to comply with the Phase 2 engine standards being adopted today. We expect that the information generated by this program will be useful in informing any future consideration of PM or HAP standards for small SI engines.

In the July 1999 SNPRM, we proposed the addition of two nonhandheld classes and standards for each class that would be implemented upon the effective date of the final rule. We specifically requested comment on the assumption that 2-stroke engines would not proliferate into these new classes, on the level of the proposed standards, and the feasibility of achieving tighter

emission standards with OHV, SV and 2-stroke engines. We received a number of comments related to the proposed Class I-A and Class I-B provisions. In general, engine manufacturers supported the proposed program for Class I-A and Class I-B engines, including the proposed standards. One engine manufacturer commented that we should consider tightening the standards because catalysts are more practical on nonhandheld applications. In terms of concern of 2-stroke lawnmowers proliferating into these new classes, several engine manufacturers stated that the power requirements of the lawnmower will not allow such small engines to be used in the application. (Under our Phase 1 program, engine manufacturers are allowed to certify a limited number of 2-stroke engines for use in lawnmowers to the handheld engine standards through the 2002 model year. Beginning with the 2003 model year, such engines will be required to meet the applicable nonhandheld engine standards.) One manufacturer commented that the standards are so low in the proposed classes that the only 2-stroke engine likely to be able to meet such standards in applications is a 2-stroke with fuel injection, which would be prohibitively expensive and therefore commercially unrealistic. Finally, one manufacturer that currently certifies an engine that would be considered a Class I-B engine under the proposed changes, submitted comments suggesting that we consider a short delay in implementing the Class I-B standards because of difficulty in recertifying current engines in a such short period of time.

With today's action, we are adopting the Class I-A and Class I-B standards as proposed. Table 3, presented earlier, contains the Phase 2 standards being adopted for Class I-A and Class I-B engines. Based on the comments submitted by manufacturers, we do not believe there is any need to be concerned at this time over the possibility of 2-stroke engines proliferating in these

nonhandheld engine classes. With regard to the issue of tighter standards through the application of catalysts raised by one manufacturer, we believe that issue should be addressed in future rulemakings that affect all nonhandheld engines, since the current standards for Phase 2 nonhandheld engines were set at levels that did not consider the use of catalysts. With regard to the implementation date of the new standards, we are adopting a slight delay for implementation of the Class I-A and Class I-B standards to the 2001 model year. Under the provisions of the July 1999 SNPRM, implementation of the Class I-A and Class I-B standards would have begun upon the effective date of the final rule, which is 60 days after publication in the Federal Register. This would have meant a manufacturer would have to immediately recertify current Phase 1 designs that fall under the 100cc displacement cutoff for Class I-A and Class I-B. We do not believe this is necessary given the limited number of engines expected to covered by these provisions. Therefore, under today's action, manufacturers may wait until the 2001 model year to certify engines below 100cc to the Class I-A and Class I-B provisions.

We received comments from a large number of logging related companies requesting an exemption for professional and commercial chainsaws above 50cc from the Phase 2 regulations. The parties expressed concerns that increased weight could lead to operator fatigue and a greater risk of injury, about power loss, cost, limited impact of such equipment on the environment, and forest fire/safety concerns from catalysts. They also noted these applications are already subject to Phase 1 requirements. Under today's action, handheld engines used in professional and commercial chainsaws above 50cc (i.e., Class V engines) will be required to meet the Phase 2 standards. We are aware of the impact that increased weight can have on a logger that utilizes the equipment on a

regular basis as well as the concern over the increased risk of potential forest fires with the use of catalysts. However, we conclude that manufacturers of engines used in professional chainsaws will be able to meet the standards being adopted today for Class V through the use of technologies such as the stratified scavenging with lean combustion technology or compression wave technology which do not have significant impacts on equipment weight or power. In addition, the estimated increase in equipment cost due to the Phase 2 standards compared to the current cost of such equipment is estimated to be at or below 10 percent. With regards to the use of catalysts on these applications, we believe the standard for Class V engines being adopted today and the technologies expected to be available for meeting the standards will not require the use of catalysts on these engines. Therefore the increased exhaust temperature concerns noted by commenters are not expected to be an issue for these engines.

As described in section II.A.2 of the Preamble and Chapter 3 of the RIA, EPA's conclusion is that the standards adopted today, considering the lead time provided and other flexibility provisions such as averaging, banking, and trading, are technologically feasible for this industry and appropriate under section 213 of the Clean Air Act. At the same time, EPA recognizes that certain manufacturers who will be subject to these provisions believe that the standards may not be technologically feasible for them. This issue was most clearly raised with respect to the Class V standards, even though Stihl has certified a Class V engine in California at levels that would meet our final standards. While EPA's adoption of the standards reflects our view that our Class V standards are achievable, EPA also believes that it is appropriate in responding to the manufacturers' comments and concerns to establish a procedure that will allow all members of the regulated industry

as well as other interested parties to continue to explore the issue of technological feasibility of the Class V standards as industry makes progress in moving towards implementation of this program. EPA is therefore committing to perform a study of the technological feasibility of the Class V standards we are adopting today, to be completed by the end of 2002. EPA intends the technology study to focus on availability of technology, certification data, in-use performance, and other factors of interest to the parties, such as availability and pricing of credits. EPA expects that this study will involve EPA discussion with individual manufacturers, as well as a public notice and comment process exploring the issues of technological feasibility for Class V.

3. NMHC+NOx Standard for Class I-B Natural Gas-Fueled Engines

In the July 1999 SNPRM, we proposed standards for Class I-B engines fueled by natural gas. We also requested comment on the need to establish standards for Class I-A engines operated on natural gas. No comments were received on either of these issues. We are finalizing the NMHC+NOx standard for Class I-B natural gas-fueled engines as proposed. To be consistent with the implementation date for Class I-A and Class I-B noted in section II.A.3., the standard for Class I-B natural gas-fueled engines will take effect with the 2001 model year.

4. Useful Life Categories

With today's action, we are adopting the three different useful life categories for handheld engines as proposed. Therefore, a manufacturer will choose between useful life categories of 50,

125, and 300 hours. A manufacturer would be responsible for demonstrating compliance with the Phase 2 handheld engine standards described in today's action at whichever useful life level it designated for its engine families. We believe that 50 hours is appropriate for most of the products targeted at the home consumer and 300 hours is appropriate for products targeted at the commercial market. Some engines targeted for home consumer use (including some new engines which are expected to enter the market in the next few years) are expected to have designs which tend to be more durable than the 50 hour consumer grade designs yet are not as durable as the 300 hour commercial grade designs. Such engines can be certified to the intermediate useful life category of 125 hours.

For the newly designated category of Class I-A engines, we are adopting the handheld engine useful life categories of 50, 125, and 300 hours, as proposed. We believe the engine designs in Class I-A will be similar to handheld engines in terms of design durability. In addition, the useful life designations for Class I-A engines are the same as those established by the California ARB in its Tier 2 rule for engines of this size range. For the newly designated category of Class I-B engines, we are adopting useful life categories of 125, 250 or 500 hours, as proposed. These useful life categories are the same as we finalized for Class I nonhandheld engines in March 1999 because we believe the engines designs in Class I-B will be similar to Class I nonhandheld engines in terms of design durability. In addition, the useful life designations for Class I-B engines are the same as those established by the California ARB in its Tier 2 rule for engines of this size range.

5. Selection of Useful Life Category

As proposed in the July 1999 SNPRM, today's action assigns the responsibility for selecting the useful life category to the engine manufacturer. For manufacturers of handheld engines, virtually all engines are placed in specific equipment also manufactured by the engine manufacturer or, in those cases where engines are supplied to another equipment manufacturer, into equipment well known by the engine manufacturer. Handheld engine manufacturers know the design features and performance characteristics of both their engines and the equipment in which they are installed, and understand the expected in-use operation of this equipment and thus the expected useful life of the engine. Additionally, based on design features these manufacturers build into their engines, they have a good idea of the expected useful life in such applications. Similarly, we expect that manufacturers of Class I-A and Class I-B engines will have a good idea of the types of equipment their engines are expected to be used in and, from their marketing information, a reasonably accurate projection of the relative volumes in such applications. Given that many of these engines will be used in new applications, manufacturers should have an even clearer understanding of these projections. Relying on this information, manufacturers should be able to make good selections of appropriate useful life categories for their engines.

While today's action leaves the responsibility of selecting the useful life category to the manufacturer, we expect that we would periodically review manufacturers' decisions to ensure this regulation is being properly implemented and to determine whether modifications to the rules are appropriate. We believe it is important that appropriate useful life periods be selected especially because handheld engines, Class I-A engines, and Class I-B engines covered by today's action are included in the ABT program where the useful life period selected by the manufacturer has a direct

impact on the number of credits which can be generated or need to be used. Therefore, proper selection of the useful life period is important to ensure that the ABT program is fair and environmentally sound.

6. Certification Test Procedure

With today's action, we are retaining the current test procedure used by manufacturers to certify handheld engines with one change that was proposed in the January 1998 NPRM. For Phase 2, the weighting of the two different test modes used for calculating certification emission levels for handheld engines is being changed to 85 percent for the wide open throttle mode and 15 percent for the idle mode. The revised weightings are based on information submitted by manufacturers on actual handheld equipment being operated in real world conditions. (The weighting of the modes for Phase 1 handheld engines is 90 percent for the wide open throttle mode and 10 percent for the idle mode, and will remain so for the duration of the Phase 1 program.)

B. What are the Provisions of the Averaging, Banking, and Trading Program?

With today's action, we are adopting provisions to include all Phase 2 handheld engines and the newly designated nonhandheld engine classes (Class I-A and Class I-B) in the certification averaging, banking, and trading (ABT) program adopted in the March 1999 final rule for Phase 2 nonhandheld engines Averaging means the exchange of emission credits among engine families within a given engine manufacturer's product line. Averaging allows a manufacturer to certify one

or more engine families to Family Emissions Limits (FELs) above the applicable emission standard. However, the increased emissions have to be offset by one or more engine families certified to FELs below the same emission standard, such that the average emissions in a given model year from all of the manufacturer's families (weighted by various parameters including engine power, useful life, and number of engines produced) are at or below the level of the emission standard. Banking means the retention of emission credits by the engine manufacturer generating the credits for use in future model year averaging or trading. Trading means the exchange of emission credits between engine manufacturers which then can be used for averaging purposes, banked for future use, or traded to another engine manufacturer.

The following section describes the ABT program as it will apply to handheld engines, Class I-A engines, and Class I-B engines. The basic framework of the ABT program is the same as that finalized for nonhandheld engines in March 1999. To address comments submitted on the July 1999 SNPRM relating to the stringency of the standards and the phase-in periods, we have made a number of changes to the ABT program proposed in the July 1999 SNPRM and such changes are noted in the following section. In addition, the Summary and Analysis of Comments Document contains a complete description of comments received on the proposed ABT program and our response to those comments.

Because the Phase 1 rule did not include an ABT program, this will be the first ABT program for handheld engines. We believe the ABT program is an important element in ensuring that the stringent Phase 2 emissions standards being adopted today will be achievable with regard

to technological feasibility, lead time, and cost. The ABT program is intended to enhance the flexibility offered to engine manufacturers that will be needed in transitioning their product lines to meet the stringent HC+NOx standards being adopted with today's action. The ABT program also encourages the early introduction of clean engines certified under the Phase 2 requirements, thus securing earlier emission benefits.

We believe that the ABT program being adopted for handheld engines, Class I-A engines, and Class I-B engines is consistent with the statutory requirements of section 213 of the Clean Air Act. Although the language of section 213 is silent on the issue of averaging, it allows us considerable discretion in determining what regulations are most appropriate for nonroad engines. The statute does not specify that a specific standard or technology must be implemented, and it requires us to consider costs, lead time, safety, and other factors in making our determination of the greatest degree of emissions reduction achievable through the application of technology which will be available. Section 213(a)(3) also indicates that our regulations may apply to nonroad engine classes in the aggregate, and need not apply to each nonroad engine individually.

As noted above, the ABT program will apply to all classes of handheld engines as well as Class I-A and Class I-B engines. The ABT program will be available for HC+NOx emissions but will not be available for CO emissions. The ABT program will also apply to natural gas-fueled engines. All credits for natural gas-fueled engines will be determined against the standards to which the engine is certified (either the HC+NOx standard or the optional NMHC+NOx standards noted earlier). Under the program being adopted today, manufacturers are allowed to freely exchange

NMHC+NOx credits with HC+NOx credits.

Today's action places no restrictions on credit exchanges across any of the classes of small SI engines. Under the ABT program, manufacturers will be allowed to exchange credits from handheld engines to nonhandheld engines and visa versa. Given the stringent level of the standards recently finalized for nonhandheld engines and the stringent level of the standards contained in today's final rule, we do not expect that credits from one class will result in delays in technology improvement for other classes, and do not believe that any cross-class restrictions are necessary.

Under an ABT program, a manufacturer establishes a family emission limit (FEL) for an engine family that takes the place of the emission standard for all compliance determinations. In addition, as part of the ABT program, we establish upper limits on the FEL values that may be declared by manufacturers. The FEL upper limits contained in the July 1999 SNPRM for handheld engines were 300 g/kW-hr for Class III engines, 246 g/kW-hr for Class IV engines, and 166 g/kW-hr for Class V engines and were based on the combination of the Phase 1 HC standard and NOx standard. One engine manufacturer submitted comments on the proposed FEL upper limits and suggested that they should be raised by 12 percent to account for differences between the Phase 1 and Phase 2 programs. The differences specifically cited by the manufacturer that could cause current Phase 1 engines to exceed the proposed FEL upper limits included the change in the weighting of the two test modes (when calculating certification emission levels) and the need to factor in deterioration over the useful life of the engine. While most current engines are certified well below the Phase 1 emission standards, we agree that certain engines, especially those certified

closer to the Phase 1 standards, could exceed the proposed FEL upper limits under the Phase 2 program, primarily because the new weighting of the individual test modes in Phase 2 will lead to a higher certification level for such engines, and to a lesser extent because of potential deterioration over the useful life that must be accounted for under the Phase 2 program. Therefore, we are adopting FEL upper limits suggested by the manufacturer that are slightly higher than those proposed in the July 1999 SNPRM to account for the differences between the Phase 1 and Phase 2 programs noted above. The HC+NOx FEL upper limits being adopted with today's action are 336 g/kW-hr for Class III engines, 275 g/kW-hr for Class IV engines, and 186 g/kW-hr for Class V engines. For the newly designated categories of Class I-A and Class I-B engines, we did not receive any comments on the proposed FEL upper limits. Therefore, we are adopting HC+NOx FEL upper limits of 94 g/kW-hr and 50 g/kW-hr, respectively, as proposed.

Under the ABT program, all credits will be calculated based on the difference between the manufacturer-established FEL and the Phase 2 HC+NOx standard for the applicable model year using the following equation.

Credits = (Standard - FEL) x Production x Power x Useful life x Load Factor

At the time of certification, manufacturers will be required to supply to us the appropriate information used in the above noted equation. "Production" represents the manufacturer's U.S. production of engines for the given engine family, excluding exported engines and engines that are introduced into commerce for use in California. "Power" represents the maximum modal power of

the certification test engine over the certification test cycle. "Useful Life" is the regulatory useful life established by the manufacturer for the given engine family. "Load Factor" is a constant that is dependent on the test cycle over which the engine is certified.

In order to demonstrate compliance with the applicable HC+NOx emission standard in a given model year, a manufacturer participating in the ABT program will be required to show that the number of HC+NOx credits available to the manufacturer are equal to or greater than the number of credits needed by engines certified with FELs above the applicable standards in that model year. This will be done by using credits generated in that model year by engines certified with FELs below the applicable standard, banked credits, or credits obtained in a trade from another small SI engine manufacturer.

With regard to credit life, the final rule differs from the proposed provisions of the ABT program in order to address comments received on the SNPRM relating to the stringency of the standards and the phase in periods. Under the ABT provisions being adopted today for handheld engines, manufacturers will be able to select from two options for the purpose of generating credits. These two programs also have unique credit life opportunities. Under the program referred to as the "Normal Credit" program, manufactures certifying engine families with FELs at or below 72 g/kW-hr will have an unlimited credit life. Such credits will be available to the manufacturer for the duration of the Phase 2 program and will not be discounted in any manner under the Normal Credit program. Credits generated by engines certified with FELs above 72 g/kW-hr can be used by a manufacturer in the model year in which they are generated for its own averaging purposes, or traded

to another manufacturer to be used for averaging purposes in that model year. However, such credits generated by engines may not be carried over to the next model year, including when traded to another manufacturer.

Alternatively a manufacturer may choose to have a family participate in what is referred to as the "Optional Transition Year" credit program. Under this program, any family with FELs below the applicable phase-in standards is eligible to generate credits. However, these credits will be progressively discounted the higher the family's FEL is compared to the final standards for that class. For example, in Class IV, a family with an FEL 99 g/kW-hr or higher in 2002 will have its credits discounted by 75 percent before they can be used in future model years. If the family's FEL was equal to 87 g/kW-hr but less than 99 g/kW-hr, its credits will be determined by the difference between its FEL and the Class IV standard for model year 2002 (196 g/kW-hr) and then discounted by 50 percent before being used in future model years. This combination of ability to generate credits with families of higher emission levels but discounting the credits for these higher emitting engines provides an increased incentive for manufacturers to make interim emission improvements while still preserving the environmental benefits of this program. We are also providing an additional incentive for manufacturers who produce especially clean equipment by providing a 25% bonus for credits generated below specified levels.

While normal program credits do not have an expiration date, special program credits have a limited life and application. They may be used without limitation through the 2007 model year. For model years 2008 through 2010, they may also be used, but only if the manufacturer's product

line is, without the use of any credits, below a level determined by production weighting the manufacturer's product line assuming emission levels of 72 g/kW-hr for Class III, 72 g/kW-hr for Class IV and 87 g/kW-hr for Class V.

These programs also respond to manufacturer concerns that the rule should provide that the technologies in which they considerably invested to meet California standards could also be sold nationally, at least through the phase-in years without penalty. Also, allowing carryover credits to be generated from such engines provides an additional incentive for manufacturers to market nationally the clean technologies they have developed for California.

Under the ABT program, manufacturers of handheld engines will be allowed to use portions of the ABT program prior to implementation of the Phase 2 standards to provide an incentive to accelerate introduction of cleaner technologies into the marketplace. We believe that making bankable credits available prior to the effective date of the new standards will reward those manufacturers who take on the responsibility of complying with the Phase 2 requirements sooner than required and will also result in early environmental benefits.

Under the early banking provisions for handheld engines, manufacturers will be allowed to begin using the averaging and banking portions of the ABT program beginning with the 2000 model year. However, only those engines certified to the Phase 2 requirements and produced after the effective date of this action will be eligible for early credits in the 2000 model year. As proposed, all early credits will be calculated against the first year phase in standards for the applicable engine

class (i.e., 238 g/kW-hr for Class III engines, 196 g/kW-hr for Class IV engines, and 143 g/kW-hr for Class V engines) until the first year that the Phase 2 standards apply for the appropriate engine class. This approach for early credits from handheld engines is similar to the approach recently finalized for nonhandheld engines where early credits are generated only from engines with FELs below the final standards, not the initial phase in standards. After considering comments submitted on the SNPRM, we now believe a similar approach is appropriate for handheld engines in order to provide us with sufficient assurance that the ABT program will not contribute to a significant delay in implementation of the low-emitting technologies envisioned under the Phase 2 program.

Because the Phase 2 standards for Class I-A and Class I-B engines that are being adopted today are scheduled to take effect so soon (beginning with the 2001 model year) and because manufacturers indicated they would not be ready to implement these standards sooner, no opportunity exists for generating credits. Therefore, we are not adopting early credit provisions for Class I-A and Class I-B engines.

Engines for which a manufacturer generates early credits will have to comply with all of the requirements for Phase 2 engines (e.g., full useful life certification, the Production Line Testing program requirements, etc.). Manufacturers of handheld engines will not be allowed to trade their early engine credits to other manufacturers until the first effective model year of the Phase 2 standards for the applicable engine class.

As discussed in section II.D. of today's action, we are adopting several compliance flexibility

provisions for engine manufacturers and equipment manufacturers that allow the limited use of Phase 1 engines in the Phase 2 time frame. Phase 1 engines sold by engine manufacturers under the flexibility provisions will be excluded from the ABT program. In other words, engine manufacturers will not have to use credits to certify Phase 1 engines used for the flexibility provisions even though they will likely exceed the Phase 2 standards being adopted today.

As noted elsewhere in today's final rule, we are adopting a number of provisions that address post-certification compliance aspects of the new standards. Under certain conditions, we will allow manufacturers to use credits from the certification ABT program to address excess emissions situations determined after the time of certification. As noted in the discussion on compliance, we do not believe that the typical type of enforcement action that could be taken when a substantial nonconformity is identified (i.e., an engine family recall order) will generally be workable for small SI engines given the nature of the market. Instead, for the purposes of implementing the PLT program, we are adopting provisions to allow manufacturers to use engine certification ABT credits to offset limited emission performance shortfalls for past production of engines determined through the PLT program. The conditions under which we will allow manufacturers to use certification ABT credits to offset such emission performance shortfalls are described in section II.C. of today's action.

Under today's action, we will not allow manufacturers to automatically use ABT credits to remedy a past production nonconformance situation identified through the Selective Enforcement Audit (SEA) program. As described in today's action, we expect to primarily rely on the PLT program to monitor the emissions performance of production engines. However, it is possible that

we may conduct SEAs in certain cases. Therefore, as discussed in section II.C., if we determine that an engine family is not complying with the standards as the result of an SEA, we will work with the manufacturer on a case-by-case basis to determine an appropriate method for dealing with such a nonconformity. The option(s) we select, after consultation with the engine manufacturer may, or may not, include the use of ABT credits to make up for any "lost" emission benefits uncovered by the SEA. This program is consistent with the program adopted for nonhandheld engines under Phase 2.

C. What are the Provisions of the Compliance Program?

The compliance program being adopted today is comprised of three parts: a pre-production certification program during which manufacturers evaluate the expected emission performance of their engine designs including the durability of that emission performance; a production line test program during which manufacturers perform emission tests on randomly selected products coming off the assembly line to assure their designs as certified continue to have acceptable emission performance when put into mass production; and a voluntary in-use test program during which participating manufacturers evaluate the in-use emission performance of their product under typical operating conditions. In addition to the manufacturer-directed provisions of the compliance program, we will also have the option to conduct our SEA program and our own in-use testing program for small SI engines, either generally or on a case-by-case basis.

Under the compliance programs, a manufacturer will divide its product offering based upon

specific design criteria which have the potential for significantly different emission performance; these subdivisions are called engine families. Each engine family will be required to meet the standard applicable for the class in which that engine resides unless the manufacturer chooses to participate in the ABT program also being proposed today. (See section II.B. of today's action for discussion of the ABT program.) The other provisions of the compliance program are explained in more detail below. In all cases, to the best of our knowledge, the requirements of the federal compliance program will be sufficiently similar to the requirements of the California ARB program for these engines such that for engine families sold in both the State of California and nationally, the engines selected for testing, the test procedures under which they are tested, and the data and other information required to be supplied by regulations, can be the same under both programs. Thus, we expect that a manufacturer will be able to compile one application for certification satisfying the information needs of both programs, saving the manufacturer time and expense. Similarly, the EPA and the California ARB expect to share information from their compliance programs such that any production line testing or in-use testing conducted for one agency should satisfy the similar needs of the other agency, again minimizing the burden on the manufacturers.

1. Certification

This section addresses the certification program for engine manufacturers covered by today's action. As required in the Act, the certification process is an annual process. In addition, the Act prohibits the sale, importation, or introduction into commerce of regulated engines that are not covered by a certificate. The provisions of the certification program being adopted today are the

same as contained in the July 1999 SNPRM. The only comments received on the July 1999 SNPRM supported the certification program as proposed. With today's action, we are adopting a certification program that harmonizes the handheld Phase 2 program with the requirements of the California ARB's Regulations for 1995 and Later Small Off-Road Engines, amended January 29, 1999. In addition, the general certification requirements for manufacturers of handheld engines will be the same as those finalized for nonhandheld engines in March 1999.

Under today's action, manufacturers of handheld engines will be required to demonstrate that their regulated engines comply with the appropriate emission standards throughout the useful life of the engine family. To account for emission deterioration over time, manufacturers will need to establish deterioration factors for each regulated pollutant for each engine family. Manufacturers will be able to establish deterioration factors by using bench aging procedures which appropriately predict the in-use emission deterioration expected over the useful life of an engine or an in-use evaluation which directly accounts for this deterioration. As is the case with many of our mobile source regulations, the multiplicative deterioration factors cannot be less than one. Additionally, where appropriate and with suitable justification, deterioration factors can be carried over from one model year to another and from one engine family to another.

Today's action also provides flexibility for small volume engine manufacturers and small volume engine families. Under the flexibilities being adopted today, handheld engine manufacturers will be allowed the option of using assigned deterioration factors we have established in the regulations. The deterioration factors, either assigned or generated, will be used to determine

whether an engine family complies with the applicable emission standards in the certification program, the PLT program, and the SEA program.

As with the Phase 1 program, manufacturers will be allowed to submit Phase 2 certification applications to us electronically, either on a computer disk or through electronic mail, making the certification application process efficient for both manufacturers and for us. Also, in coordination with the California ARB, we have established a common application format that will allow manufacturers to more easily apply for certification.

In today's final rule, we are also adopting a method by which manufacturers can separately certify configurations for use at high altitude. The provisions being adopted today are the same as we proposed in the July 1999 SNPRM. Manufacturers are currently required by the Phase 1 rule to certify engines for use at any altitude, but the rule does not specifically address separate high altitude and low altitude configuration testing. The need for the high altitude modifications has been a topic of recent discussions between us and manufacturers. To allow an engine to perform properly and meet emission standards while being operated at high altitudes, many manufacturers have developed special high altitude adjustments or high altitude kits which include replacement of some parts such as carburetor jets. However, if an engine with such a kit installed is operated outside of a high altitude location, the kit would have to be removed and the engine returned to its original configuration for the engine to continue to perform properly and meet emission standards.

Today's action will allow manufacturers of both handheld and nonhandheld engines to certify

an engine for separate standard and high altitude configurations. All engines will be required to meet, under all altitude conditions, the applicable emission standards. The option will be available for both Phase 1 and Phase 2 handheld and nonhandheld engines. Without such a certification option, we could potentially consider the installation of an altitude kit and other associated modifications as tampering. No test data on engines with high altitude modifications performed will be required as a condition of certification, as this would add significantly to the manufacturer's certification compliance testing cost. Furthermore, no testing seems necessary since the altitude kits and associated modifications are intended to compensate for the change in air density when moving to high altitude by returning the engine to approximately the same operating point as evaluated during required certification testing. Similarly, no special labeling will be required for engines which have such altitude kits certified or for those in-use engines which have had altitude modifications performed. Consumers have a natural incentive to have the high altitude kit installed and adjustments performed when using an engine at high altitude as this greatly improves performance; for the same reason we expect the modifications would be removed when returning the engine to low altitude. However, we believe some additional assurance is needed that the high altitude modifications are designed to provide good emission control and that the instructions for making these modifications are clear and readily available and thus likely to be performed correctly.

To provide this assurance, today's action requires a manufacturer to list these altitude kits with their appropriate part numbers along with all the other certified parts in the certification application. In the application, the manufacturer will have to declare the altitude ranges at which the appropriate kits should be installed on or removed from an engine for proper emission and engine

performance. The manufacturer will also be required to include a statement in the owner's manual for the engine or engine/equipment combination (and other maintenance-related literature intended for the consumer) that also declares the altitude ranges at which the appropriate kits must be installed or removed. Finally, the manufacturer, using appropriate engineering judgement which, at the manufacturer's option, can also include test data, will be required to determine that an engine with the altitude kit installed will meet all of the applicable emission standards throughout its useful life. The rationale for this assessment will need to be documented and provided to us as part of the certification application.

2. Production Line Testing - Cumulative Summation Procedure

This section addresses the production line testing (PLT) program for engines covered by today's action. The provisions of the PLT program being adopted today are the same as we proposed in the July 1999 SNPRM and mirror the provisions of the PLT program adopted in March 1999 for nonhandheld engines. In addition, the provisions of the PLT program are the same as the corresponding program implemented by the California ARB, allowing manufacturers to use the same procedures for testing production engines for both agencies. The PLT program will require manufacturers to conduct manufacturer-run testing programs using the Cumulative Summation Procedure (CumSum).[4] The CumSum program, will require manufacturers to conduct testing on

[4] The CumSum procedure has been promulgated for marine SI engines at 40 CFR Part 91 (61 FR 52088, October 4, 1996) and for nonhandheld small SI engines at 40 CFR Part 90 (64 FR 15208, March 30, 1999). In this section, "PLT" refers to the manufacturer-run CumSum procedure. "PLT" does not include Selective Enforcement Auditing (SEA), which is addressed separately in section II.C.4. of this preamble.

each of their engine families (unless they have been relieved of this requirement under the flexibility provisions described in section II.D.). The maximum sample size that will be required for each engine family is 30 engines or 1 percent of a family's projected production, whichever is smaller. However, the actual number of tests ultimately required will be determined by the results of the testing. Manufacturers will be able to submit PLT reports to us electronically, either on a computer disk or through electronic mail, which will save time and money for both the engine manufacturers and for us.

As mentioned in the discussion of the certification ABT program, above, manufacturers can, for a limited amount of production, use ABT credits to offset the estimated excess emissions of previously produced noncomplying engine designs as determined in the PLT program. (The amount of excess emissions will be determined based on the difference between the new FEL established by the manufacturer as a result of the PLT program and the original FEL established prior to the PLT program.) Under today's action, a manufacturer will be allowed to raise the FEL for one engine family per model year. If a PLT program failure requires a manufacturer to raise the FEL for more than one engine family per model year, the manufacturer can do so only if the applicable engine family represents no more than ten percent of the manufacturer's production for that model year. For any additional engine families that are found to be in noncompliance as a result of the PLT program, the engine manufacturer will need to conduct projects approved by us that are designed to offset the excess emissions from those engines.

Several engine manufacturers commented that we should eliminate any restrictions on the

use of ABT credits to offset PLT noncompliance. However, as noted above, we are retaining the limitations. We believe a major purpose of the PLT program is to help verify that the engine designs certified by manufacturers have been successfully implemented in the manufacturing process. Therefore, we expect few instances in which manufacturers will need to correct a PLT failure through raising the FEL since that would imply the manufacturer incorrectly set the initial FEL for that family. Frequent use of this remedy would suggest the manufacturer was incapable of correctly setting the FELs for its product, in which case we would have to reconsider allowing a manufacturer to participate in the ABT program at its option.

With regard to future production of engines identified to be in noncompliance as a result of PLT testing, the manufacturer will be expected to correct the problem causing the emission noncompliance either by changing the production process, changing the design (which will require recertification), or raising the FEL to compensate for the higher emissions (also requiring recertification). In the event a manufacturer raises an FEL as a result of a PLT failure, it can do so for future production as well as past production under the provisions described above which will require a calculation of the number of credits a manufacturer would need to obtain for the past production engines. It can also be noted that compliance with the applicable standard (or the applicable FEL) will be required of every covered engine. Thus, every engine that failed a PLT test will be considered in noncompliance with the standards and must be brought into compliance. Our rules allowing the use of the average of tests to determine compliance with the PLT program is intended only as a tool to decide when it is appropriate to suspend or revoke the certificate of conformity for that engine family, and is not meant to imply that not all engines have to comply with

the standards or applicable FEL.

As discussed further in section II.D, we are adopting provisions that allow small volume manufacturers and small volume engine families to be excluded from the PLT program at the manufacturer's option.

3. Voluntary In-Use Testing

This section addresses the voluntary in-use testing program being adopted today. The voluntary in-use testing program for engines covered by today's action is the same as we proposed in the July 1999 SNPRM. The comments we received on the July 1999 SNPRM supported the proposed program. The program being adopted today for handheld engines is the same as the voluntary in-use testing program we finalized in March 1999 for nonhandheld engines. The voluntary in-use testing program gives engine manufacturers the option of using a portion of their PLT resources to generate field aged emissions data. At the start of each model year, manufacturers can elect to place up to 20 percent of their engine families in this voluntary program. For those families in this program, manufacturers will not be required to conduct PLT for two model years, the current year and the subsequent year. (As noted earlier, the voluntary in-use test program has not been codified in the California ARB Tier 2 rules for small SI engines. However, we have discussed the program with the California ARB and it supports the voluntary in-use testing provisions contained in today's action.) Instead, manufacturers will place a minimum of three randomly selected production engines in existing consumer-owned, independently-owned, or manufacturer-

owned fleets. Manufacturers will install the engines in equipment that represents at least 50 percent of the production for an engine family and age the engine/equipment combination in actual field conditions to at least 75 percent of each engine's regulatory useful life. Once an engine in this program has been sufficiently field aged, the manufacturer will conduct an emissions test on that engine. The results of these tests will then be shared with us. If any information derived from this program indicates a potential substantial in-use emission performance problem, we anticipate that the manufacturer will seek to determine the nature of the emission performance problem and what corrective actions might be appropriate. We plan to offer our assistance in analysis of the reasons for unexpectedly high in-use emission performance as well, and of what actions may be necessary or appropriate for reducing such high emissions. Manufacturers will have three calendar years from the date they notify us of their intent to include a family in the voluntary in-use testing program to complete the actual in-use testing.

While the compliance program being adopted today will not require a manufacturer to conduct any in-use testing to verify the continued satisfactory emission performance in the hands of typical consumers, we believe it is worthwhile to have an optional program for such in-use testing. We believe it is important for manufacturers to conduct in-use testing to assure the success of their designs and to factor back into their design and/or production process any information suggesting emission problems in the field. In order to encourage participation in this voluntary in-use testing program, we would not expect to use the data from this program as the primary basis for a noncompliance determination. However, neither could we entirely disregard it, and we could always choose to conduct our own in-use compliance program that could form the primary basis for a

noncompliance determination. We would expect to conduct such a test program separate from this voluntary manufacturer testing program, to further enable us to determine whether a specific group of engines is complying with applicable in-use standards.

Although we are not finalizing a mandatory in-use testing program as proposed in the January 1998 NPRM, we did finalize the in-use noncompliance provisions for Phase 2 engines as part of the March 1999 final rule for nonhandheld engines (see 64 FR 15208: Subpart I, section 90.808). These provisions will now apply to Phase 2 handheld engines as well. Under these provisions, if we determine that a substantial number of engines within an engine family, although properly used and maintained, do not conform to the appropriate emission standards, the manufacturer will be required to remedy the problem and conduct a recall of the noncomplying engine family as required by CAA section 207. However, we also recognize the practical difficulty in implementing an effective recall program as it would likely be impossible to properly identify all of the owners of equipment using small engines (there is no national requirement to register the ownership of such equipment), and it is also highly questionable whether all owners or operators of such equipment would respond to an emission-related recall notice. Therefore, under the final program, our intent is to generally allow manufacturers to nominate alternative remedial measures to address most potential non-compliance situations, as the January 1998 NPRM discussed (see 63 FR 3992). We expect that, if successfully implemented, the use of appropriate alternatives should obviate the need for us to make findings of substantial nonconformity under section 207. In evaluating manufacturer-nominated alternatives, we would consider those alternatives which (1) represent a new initiative that the manufacturer was not otherwise planning to perform at that time and that has a nexus to the emission problem

demonstrated by the subject engine family; (2) cost substantially more than foregone compliance costs and consider the time value of the foregone compliance costs and the foregone environmental benefit of the subject family; (3) offset at least 100 percent of the exceedance of the standard or FEL; and (4) are able to be implemented effectively and expeditiously and completed in a reasonable time. These criteria would guide us in evaluating projects to determine whether their nature and burden is appropriate to remedy the environmental impact of the nonconformity while providing assurance to the manufacturer that we would not require excessive projects.

In addition to being evaluated according to the above criteria, alternatives would be subject to a cost cap. We would expect to generally apply a cost cap of 75 percent above and beyond the foregone costs adjusted to present value, provided the manufacturer can appropriately itemize and justify these costs. We believe that this is an appropriate value that, in most cases, should be both "substantial" and sufficient to encourage manufacturers to produce emission durable engines.

4. Selective Enforcement Auditing

This section addresses the SEA program being adopted today. The provisions of the SEA program being adopted are the same as those adopted in March 1999 for Phase 2 nonhandheld engines. As noted in the both the January 1998 NPRM and July 1999 SNPRM, we do not view the SEA program as the preferred production line testing program for small engines. The CumSum procedures, described above, are being adopted as the production line program that manufacturers will conduct. The SEA program included in today's action is intended as a "backstop" to the

CumSum program and will be used in cases where we believe there is evidence of improper testing or of a nonconformity that is not being addressed by the CumSum program. The SEA program will also be primarily applicable to engine families optionally certified under the small volume manufacturer provisions and the small volume engine family provisions, where manufacturers may elect not to conduct PLT testing for such families. However, as for other families, we do not expect families certified under the small volume provisions will be routinely tested through an SEA program.

Two handheld industry groups commented that we should eliminate the proposed restrictions on the retroactive use of ABT credits for SEA failures. We believe the main purpose of an SEA program is to determine whether the engine designs certified by manufacturers have been successfully implemented by manufacturers in the manufacturing process. Therefore, in contrast to the PLT program being adopted today, we do not believe manufacturers who fail an SEA should have the automatic option of using ABT credits to remedy noncomplying engines already introduced into commerce. The PLT program is designed to allow a manufacturer to continually evaluate its entire production and quickly respond to the results throughout the model year. We believe that allowing a manufacturer to use credits, for a limited amount of engines, to remedy past production emission failures is consistent with the continual evaluation provided by the PLT program. The SEA program, in contrast, is designed to be a one time, unannounced inspection of a manufacturer's production line with definitive passing or failing results. We believe that in this type of a compliance program, where at most only a few engine families might be tested each year, manufacturers must place more emphasis on the transition from certification to the production line

and must set initial FELs accurately. Therefore, to encourage accurate FEL settings at the time of certification, the SEA program adopted today will not allow manufacturers to automatically remedy SEA failures by retroactively adjusting FELs. We continue to believe the remedies for an SEA failure will be best determined on a case-by-case basis which may or may not include the use of ABT credits, in our judgement, depending upon our assessment of the specific case.

D. What Flexibilities are being Adopted for Engine and Equipment Manufacturers?

The following section describes the flexibilities available to engine and equipment manufacturers under the Phase 2 program being adopted today. The flexibilities are being adopted to ease the transition from the Phase 1 to the Phase 2 program, to ensure that the Phase 2 standards are cost-effective and achievable, and to reduce the compliance burden while maintaining the environmental benefits of the rule. Several comments were received on the flexibilities proposed in the July 1999 SNPRM, some supporting the proposed flexibilities and others offering recommended changes. Areas where changes have been made in response to comments on the July 1999 SNPRM are noted in the following discussion. The Summary and Analysis of Comments Document contains a complete summary and analysis of the comments submitted on the flexibilities proposed in the July 1999 SNPRM.

1. Carry-Over Certification

Consistent with other mobile source emission certification programs, we will continue to

allow a manufacturer to use test data and other relevant information from a previous model year to satisfy the same requirements for the existing model year certification program as long as the data and other information are still valid. Such "carry-over" of data and information is common in mobile source programs where the engine family being certified in the current model year is identical to the engine family previously certified.

2. Flexibilities for Small Volume Engine Manufacturers and Small Volume Engine Families

In the July 1999 SNPRM, we reproposed a number of compliance flexibilities for small volume engine manufacturers and small volume engine families. The comments we received from handheld engine manufacturers and industry groups supported the flexibilities for handheld engines, while the California ARB questioned the need for such extensive flexibilities. We continue to believe the flexibilities are appropriate to ease the transition from Phase 1 to Phase 2 for those engine families and engine manufacturers where relief is most needed. In addition, we have considered the air quality impact of these flexibilities and estimate that less than two percent of the total small engine production will likely take advantage of this option to delay compliance with the Phase 2 standards, with only a negligible impact on the emission benefits expected from the program. Therefore, with today's action, we are adopting the flexibilities as proposed in the July 1999 SNPRM with one revision to accommodate the final four year phase-in schedule being adopted today.

The three flexibilities that will be available to both small volume handheld engine families and small volume handheld engine manufacturers are as follows. (The criteria for determining

whether a specific engine family is a small volume engine family or whether an engine manufacturer is a small volume engine manufacturer is described below in sections II.D.3. and II.D.4.) First, the eligible family or manufacturer can certify to Phase 1 standards and regulations until the third year after the end of the Phase 2 implementation schedule. Because we are adopting a four year implementation schedule instead of a five year schedule as proposed in the July 1999 SNPRM, small volume engine families or small volume engine manufacturers will have until the 2008 model year for Classes III and IV and the 2010 model year for Class V engines to comply with the Phase 2 standards. Such engines will be excluded from the ABT program until they are certified to the Phase 2 standards. Second, once subject to the Phase 2 standards, the eligible family or manufacturer can certify using assigned deterioration factors. Third, the eligible family or manufacturer can elect to not participate in the Phase 2 PLT program, however, the SEA program will still be applicable.

Given the stringency of the newly adopted standards for handheld engines, we expect the major engine manufacturers will choose to modify their small volume engine families last as these often represent niche markets. Additionally, these niche applications may represent some of the more difficult engine applications due to their unique requirements. The experience gained in designing, producing and getting in-use feedback on engine family designs with large production volumes should be helpful in minimizing the cost and assuring the performance of the small volume engines. Similarly, the design challenges for the small volume engine manufacturer due to the stringent Phase 2 standards are expected to be significant and, given the limited resources of such manufacturers, suggest that more time to accomplish the transition to Phase 2 standards is warranted. We expect manufacturers will take advantage of the extra time to smooth the transition to Phase 2

standards by bringing the small volume engines into compliance throughout this time period. Due to the fact that circumstances vary greatly from one manufacturer to another, we believe it would be inappropriate to mandate a percent phase-in schedule or some other mandatory rate of phase-in for these small volume engine families and small volume engine manufacturers. Therefore, we are adopting only a final compliance requirement that is effective three years after the end of the Phase 2 phase-in schedule. We believe that a three year delay is appropriate based on discussions with manufacturers and given the number of engine families expected to be eligible for the proposed flexibilities, even with the final implementation schedule.

We did receive specific comments on one facet of one of the flexibilities for small volume engine manufacturers and small volume engine families. Two manufacturers suggested that the assigned deterioration factors we proposed in the July 1999 SNPRM should only apply for known or existing commercialized technologies. They noted that deterioration factors for new technologies cannot be assigned at this time. We agree with the comment that new technologies which have yet to be developed should not automatically be allowed to use the assigned deterioration factors specified as part of the flexibility regulations. However, based on data from currently available technologies, such as current 4-stroke engines, standard 2-stroke designs (i.e., 2-stroke designs certified under the Phase 1 program), the compression wave technology, and the stratified scavenging with lean combustion design, we believe the assigned deterioration factors as proposed are appropriate. Therefore, we are revising the regulations to note that the assigned deterioration factors may be used by 4-stroke engines, standard 2-stroke designs, the compression wave technology, and the stratified scavenging with lean combustion design. A manufacturer that would

like to use assigned deterioration factors for any other technology would need to make a request to us. We would then, with the assistance of the requesting manufacturer, determine whether the existing assigned deterioration factors were appropriate or alternative factors better represented the expected deterioration of the technology.

No comments were received on the flexibility proposed in the July 1999 SNPRM for Class I-A and Class I-B engines. Therefore, as proposed in the July 1999 SNPRM, for Class I-A and Class I-B, we are adopting only one flexibility for small volume engine families and small volume engine manufacturers. Under today's action, eligible Class I-A and Class I-B small volume engine families or manufacturers can elect to not participate in the PLT program, however, the SEA program will still be applicable.

3. Small Volume Engine Manufacturer Definition

In order to qualify as a small volume engine manufacturer and be eligible for the flexibilities described earlier, we proposed in the July 1999 SNPRM that a handheld engine manufacturer would need to produce no more than 25,000 handheld engines annually. In addition, for manufacturers of Class I-A and Class I-B nonhandheld engine families, where we also proposed limited small volume engine manufacturer flexibility, a manufacturer of such engines would need to produce no more than 10,000 nonhandheld engines annually. We received no comments on the proposed cutoff levels for the small volume engine manufacturer definitions. Therefore, we are adopting the definition of small volume engine manufacturers for handheld engines, Class I-A, and Class I-B engines that includes

the production cutoffs as proposed in the July 1999 SNPRM.

4. Small Volume Engine Family Definition

In order to qualify as a small volume engine family and be eligible for the flexibilities described earlier, we proposed in the July 1999 SNPRM that a handheld engine family, or a Class I-A or Class I-B engine family, would need to have an annual production level of no more than 5,000 engines. Without such flexibilities, we noted our belief that the cost and other difficulties of modifying small volume engine families to comply with the Phase 2 standards may be difficult enough that the manufacturer might either be unable to complete the modification of the engine design in time or may choose for economic reasons to discontinue production of the small volume engine family. The impact of such a scenario would of course fall on the engine manufacturer through reduced engine sales, but would also fall perhaps even more significantly on small volume equipment applications, the most typical use for these small volume engine families. Due to the unique character of these small volume equipment applications, it is quite possible that some equipment manufacturers might not be able to find a suitable replacement engine. In such a case, that equipment manufacturer would also be significantly impacted through lost sales, and consumers would be harmed through the loss in availability of the equipment.

We received one comment from an engine manufacturer suggesting that we raise the cutoff for small volume engine family to 10,000 units, noting that more than 95% of engines would still be covered by the full compliance program. We believe it is important to set the cutoff level for

small volume engine family at a level which provides relief to those manufacturers which genuinely need the relief the flexibilities allow. Given the other provisions being adopted today, including the four year implementation schedule and the ABT program, we continue to believe that the 5,000 unit level for determining whether an engine family is a small volume engine family is most appropriate. Therefore, with today's action, we are adopting the definition of small volume engine family as contained in the July 1999 SNPRM that includes the annual production cap to 5,000 units for handheld engine families as well as Class I-A and Class I-B engine families. Based on the cutoff being adopted today, we estimate that 98 percent of handheld engines will still be covered by the full compliance program and subject to the earliest practical implementation of the Phase 2 rule.

5. Flexibilities for Equipment Manufacturers and Small Volume Equipment Models

In the July 1999 SNPRM, we proposed three flexibilities aimed at assuring the continued supply under the Phase 2 regulations of engines for unique, typically small volume equipment applications. All of the comments received on this issue supported the proposed flexibilities. Therefore, with today's action, we are retaining the flexibilities as proposed. The three flexibilities that will be available to equipment manufacturers and small volume equipment models under the Phase 2 program for handheld engines are as follows. First, small volume equipment manufacturers will be allowed to continue using Phase 1 compliant engines through the third year after the last applicable phase-in date of the final Phase 2 standards for that engine class if the equipment manufacturer is unable to find a suitable Phase 2 engine before then. (As noted earlier, because we are adopting a four year phase in schedule instead of a five year phase in, the actual year this

flexibility expires is one year earlier than was proposed.) Second, individual small volume equipment models will be allowed to continue using Phase 1 compliant engines throughout the time period the Phase 2 regulation is in effect if no suitable Phase 2 engine is available and the equipment is currently in production at the time we are adopting these Phase 2 rules. If the equipment is "significantly modified" in the future then this exemption will end, because we believe design accommodations can and should be made during such a modification to accept an engine meeting Phase 2 standards. Third, a hardship provision will be available that allows any equipment manufacturer, regardless of size, for any of its applications, regardless of size, to continue using a Phase 1 engine for up to one more year beyond the last phase-in of the final standard for that engine class if the requirement to otherwise use a Phase 2 compliant engine will cause substantial financial hardship. This hardship provision is intended to cover those extreme and unanticipated circumstances which, despite the equipment manufacturer's best efforts, place it in a situation where a lack of Phase 2 complying engines will cause such great harm to the company that the ability of the company to stay in business is at stake. It is not intended to protect an equipment manufacturer against any financial harm or potential loss of market share. It should be noted that the flexibilities for small volume equipment manufacturers and small volume equipment models being adopted today are for equipment manufacturers only and cannot be used by engine manufacturers who also manufacture equipment. (Engine manufacturers are subject to the flexibilities for small volume engine manufacturers and small volume engine families described in section II.D.2. above.) The criteria for determining whether an equipment manufacturer is a small volume equipment manufacturer or whether a specific equipment model is a small volume equipment model is described below (see sections II.D.6. and II.D.7.).

As proposed in the July 1999 SNPRM, no flexibilities are being adopted for Class I-A or Class I-B equipment manufacturers or equipment models with today's action. Because the applications expected to use Class I-A or Class I-B engines will either be new engines and equipment designs or existing applications that use engines already certified under the Phase 1 program (and expected to be able to meet the Phase 2 standards being adopted today), we do not believe there is a need to provide flexibilities for small volume equipment manufacturers and small volume equipment models in the newly designated engine classes which allow delayed introduction of engines certified to the Phase 2 standards. We did not receive any comments on the lack of flexibilities as proposed in the July 1999 SNPRM for Class I-A or Class I-B equipment manufacturers or equipment models.

6. Small Volume Equipment Manufacturer Definition

In the July 1999 SNPRM, we proposed that small volume equipment manufacturers would be defined as those manufacturers whose annual production for sale in the U.S. across all models was 25,000 or fewer pieces of equipment utilizing handheld engines. We received no comments on this issue. Therefore, with today's action, we are adopting the definition of small volume handheld equipment manufacturer as proposed in the July 1999 SNPRM. We estimate that this limit will cover approximately two percent of the annual sales in the handheld category. Providing the flexibilities described in the previous section is expected to allow significant relief to these smallest equipment manufacturers while at the same time assuring the vast majority of equipment uses the lowest emitting engines available.

7. Small Volume Equipment Model Definition

In the July 1999 SNPRM, we proposed that the small volume equipment model definition would cover handheld models of 2,500 or less annual production. We received comments from two handheld industry organizations and two engine manufacturers suggesting that we should raise the cutoff to 5,000 units, the same as the cutoff for the small volume engine family as described earlier. Because many of the small volume equipment models use engines specifically designed for that application, we believe it would be beneficial to set the cutoff for the small volume handheld engine family and small volume handheld equipment model at the same level. Therefore, with today's action, we are revising the small volume equipment model definition by increasing the cutoff to 5,000 units or less of annual production. Providing the flexibility for small volume equipment models described earlier in section II.D.5. should allow significant relief to equipment manufacturers while at the same time assuring the vast majority of equipment uses the lowest emitting engines available.

E. Nonregulatory Programs

In the January 1998 NPRM, we discussed a voluntary "green" labeling program and a voluntary fuel spillage and evaporative emission reduction program. These programs, which could yield important environmental benefits from the small SI engine sector, are discussed in this section of the preamble.

1. Voluntary “Green” Labeling Program

In the January 1998 NPRM, we discussed the concept of a voluntary program for labeling engines with superior emission performance as a way of providing public recognition and also allowing consumers to easily determine which engines have especially clean emission performance. We discussed a threshold of around 50 percent of the proposed standard (e.g., around 12.5 g/kW-hr for Class I engines) as the level below which engines would qualify for “green” labeling. We requested comment on all aspects of the program, as well as indication of interest on the part of consumer groups, engine and equipment manufacturers, and others in working with us to develop and implement the program.

We received support for the voluntary “green” labeling program concept from several commenters, as well as suggestions for the design of such as program. Other commenters argued that a green labeling program is inconsistent with ABT, and still others supported a mandatory comprehensive labeling program to identify emissions levels above and below standards.

We remain committed to promoting clean technology, and we are interested in developing a green labeling program for small SI engines in a way that does not confuse consumers or undermine environmental goals of the Phase 2 regulations. In the design of a program, it would be necessary to review appropriate levels for a green label, given the stringency of the standards in the final program, as well as to consider the appropriate interface between a green labeling program and the ABT program that is being finalized for handheld engines. We will continue to pursue the

development of voluntary green labeling program for small SI engines as a nonregulatory program.

2. Voluntary Fuel Spillage and Evaporative Emission Reduction Program

In the January 1998 NPRM, we discussed our interest in involving stakeholders in the design of a voluntary fuel spillage and evaporative emission reduction program specifically for the small engine industry and its customers. We requested comment on the proposed voluntary partnership program, and indication of interest in participating in the partnership. Comments on this concept included both disappointment that we have not done more in these areas, as well as a willingness on the part of several commenters to work with us. We are aware of the California ARB's recent proposal to control portable fuel container spillage. However, we are not adopting such a program with today's action. At this time, we have not been able to determine the technical feasibility of substantially controlling fuel spillage and evaporative emissions from the small engine equipment sector and therefore we have not been able to determine that a program mandating such controls would be achievable for this industry. Nevertheless, we remain committed to developing voluntary programs to address fuel spillage and evaporative emission reductions.

F. General Provisions of This Final Rule

In the July 1999 SNPRM, we discussed a number of general provisions that would impact Phase 2 engines covered by today's action. These general provisions included engine labeling and emissions warranty and are discussed in the following section. Two additional general provisions

noted in the July 1999 SNPRM, the handheld engine definition and use of engines in recreational equipment, referred to a separate February 3, 1999, notice (64 FR 5251) which contained proposed amendments to the existing small SI and marine SI rules. These two additional issues, along with the other proposed amendments contained in the February 1999 proposal, are discussed in section II.G. of today's action.

1. Engine Labeling

In the July 1999 SNPRM, we proposed that manufacturers would be required to state the useful life hours on the engine label. We also proposed an alternative labeling option under which engine manufacturers could use a designator of useful life hours (e.g., A, B, or C) and then include words on the label which would direct the consumer to the owner's manual for an explanation of the meaning of the useful life designator. Finally, the July 1999 SNPRM proposed to allow other labeling options provided the Administrator determined that such options satisfied the information intent of the label. This proposed option was intended to allow for the nationwide use of the California labeling system. We also noted that in evaluating the adequacy of an alternative label, we would consider the extent to which the manufacturer's alternative engine label combined with other readily accessible consumer information adequately informed the consumer of the emission performance of the engine. The labeling requirements contained in the July 1999 SNPRM for handheld engines were the same as those adopted in the March 1999 final rule for nonhandheld engines.

We received comments on this issue from four engine manufacturers and one handheld industry organization. One manufacturer noted that they do not believe putting useful life information on the engine label will be meaningful to consumers. However, they supported the proposed alternatives. The other commenters said the we should clearly state our intention to allow the use of the California labeling system nationwide. With today's action we are adopting the labeling provisions as contained in the July 1999 SNPRM. Therefore, a manufacturer can either state the useful life hours on the engine label, or use a designator of useful life hours (e.g., A, B, or C) and then include words on the label which directs the consumer to the owner's manual for an explanation of the meaning of the useful life designator. Finally, a manufacturer could seek our approval to use the California ARB labeling system. Based on the current California ARB labeling system, we plan to approve such requests. (We are not revising the regulations at this point in time because they apply to nonhandheld engines, as well, and we did not propose such a change for nonhandheld engines.)

It should be noted that we expect to work in partnership with the industry in developing consumer outreach material to better inform consumers of the emission improvements available through the purchase of equipment using Phase 2 engines. We expect such outreach material will help to better serve the informational needs of consumers instead of having to rely only on any of the labeling options adopted today.

2. Emission Warranty

Under the current regulations, the base emission performance warranty extends for a period of two years of engine use from the date of sale. However, after the original Phase 2 NPRM was issued in January 1998, manufacturers of handheld engines indicated to us that there are applications, particularly for commercial equipment, in which the useful life hours of the entire piece of equipment can be surpassed in one year of typical in-use operation. Therefore, in the July 1999 SNPRM we proposed an option whereby manufacturers of handheld engines could request approval from us to adopt an emission warranty period of one year if they could demonstrate such a shorter warranty period would be appropriate for that engine/equipment combination.

We received comments from three handheld engine manufacturers and two handheld industry organizations noting that there are some handheld applications which will reach their expected useful life level in less than one year. Therefore, the commenters recommended that we adopt provisions to allow a manufacturer to select a warranty period of less than one year. In addition, we received a comment from one engine manufacturer that this special warranty provision should be available to all classes of small SI engines at or below 19 kW. With today's action, we are finalizing provisions for handheld engines only that would allow a manufacturer to request approval from us to adopt an emissions warranty period of less than two years if the manufacturer can demonstrate such a shorter warranty period is appropriate for that engine/equipment combination. In order to demonstrate that a shorter period is warranted, the manufacturer would need to submit information satisfactory to us demonstrating that the regulatory useful life is reached in less than two years for the typical piece of equipment. Normally, when we have established emission warranty periods, we have established both a years requirement and a second requirement based on hours of use (or miles

in some cases). The emissions warranty lasts until one of the two levels, either years or hours, is reached. However, under the Phase 1 rule for small SI engines, we established only a years requirement for the emissions warranty because there was no useful life requirement under Phase 1 and also because handheld equipment is not equipped with an hour meter. By making this change for handheld engines, and requiring manufacturers to submit information showing that a shorter warranty period is justified, we believe the emissions warranty period will not require a manufacturer to be liable for emissions performance of equipment beyond its regulatory useful life. Alternatively, we are also adopting a provision that would allow a manufacturer to request that the emissions warranty period be the shorter of two years or the regulatory useful life if the engine/equipment is equipped with an hours meter that ensures verification of hours of use. At this time, these changes to the emission warranty period will only apply to handheld engines. We did not propose such a change for nonhandheld engines in the July 1999 SNPRM and we have not received comments from anyone suggesting that such a change for nonhandheld engines is appropriate at this time.

G. Amendments to the Small SI Engine and Marine SI Engines Programs

The following section addresses the amendments to the small SI engine and marine SI engine rules that have been included in today's action. These provisions were proposed in a February 1999 NPRM separate from the July 1999 SNPRM. We have chosen to combine these amendments with the Phase 2 handheld engine provisions because most of the amendments directly affect small SI handheld engines.

1. Definition of Handheld Engine

The February 1999 NPRM included modifications to the criteria used for determining whether an engine could be classified as handheld. The proposed change was made in response to comments from Honda and others. (The July 1999 SNPRM did not propose to change the existing definition of handheld engine in effect for Phase 1, but directed readers to the February 1999 NPRM noting that we had proposed a modification to the definition.) Under the February 1999 NPRM, a manufacturer would have been permitted to exceed the current handheld engine weight limit of 14 kilograms (kg), or 20 kg for augers, in cases where the manufacturer could demonstrate that the extra weight was the result of using a 4-stroke engine or other technology cleaner than the otherwise allowed 2-stroke engine. As proposed, the revised handheld definition would have been applicable for the remainder of Phase 1 and would also apply for the Phase 2 program.

The February 1999 NPRM drew supportive comments on the change to accommodate 4-stroke engines and other clean technologies. We also received comments related to this issue in response to the July 1999 SNPRM. Some of these comments advocated that we change the weight limit we have applied to handheld equipment with most commenters indicating that we should raise the weight limit to 20 kilogram for all types of equipment. Other commenters to the July 1999 SNPRM suggested that it was not appropriate to modify the weight limit to address certain technologies and that the same limit should apply regardless of technology type.

With today's action, we are adopting the revised handheld engine definition as proposed in

the February 1999 NPRM. Therefore, the weight limit for handheld equipment will remain at 14kg (20kg for augers), except for cases where the manufacturer can demonstrate that the excess weight is the result of using a four stroke engine or advanced two stroke technology acceptable to the Administrator. We conclude that is appropriate to allow equipment classified as "handheld" to exceed the 14 kg weight limit (or 20 kg limit for augers) if the equipment exceeds the limit because of the use of 4-stroke engines or other clean technology. Otherwise, equipment manufacturers that might want to use a cleaner technology engine in a piece of equipment historically powered by a 2-stroke engine, would be prevented from doing so because of the extra weight of the cleaner engine. That result would conflict with the purpose of the program, which is to encourage technological innovation and transition to cleaner power sources for equipment. This change should prevent the undesirable situation where a manufacturer is prohibited from using cleaner technologies because of our regulatory weight limit.

We do not believe that it is appropriate to change the weight limit for all engines. The current weight limit of 14 kg for handheld equipment was established in our Phase 1 final rule after a review of available products ascertained that 14 kilograms was the break point that the market had chosen between equipment types powered with 2-stroke engines and those powered by 4-stroke engines (see 60 FR 34591; July 3, 1995). No new information was submitted with the July 1999 SNPRM comments that would cause us to believe the current weight limit is inappropriate. In addition, as noted in the February 1999 NPRM, raising the weight limit across the board would allow manufacturers to convert current 4-stroke nonhandheld equipment to dirtier 2-stroke power. We believe that , in the long run, such an increase in weight limit would encourage this change if the 2-

stroke engine would be cheaper. This would tend to be environmentally detrimental.

2. Engines Used in Recreational Vehicles and Applicability of the Small SI Regulations to Model Airplanes

The February 1999 NPRM included a proposal to classify model airplanes powered by small SI engines as recreational equipment and therefore exempt engines used in such applications from the small SI regulations. (In the July 1999 SNPRM, we directed readers to the February 1999 NPRM noting that we had proposed such a modification.)

The small SI rule as currently effective covers all nonroad spark-ignition engines at or below 19 kW "used for any purpose," subject to certain exclusions. We provided specific exclusions for certain engines used in underground mining, for engines used in motorcycles that are subject to emission regulation under 40 CFR Part 86, for engines used in passenger aircraft, and for engines used in recreational vehicles which meet certain prescribed criteria.

To qualify as an engine used in a recreational vehicle, the engine must meet all of the following criteria: (I) the engine's rated speed is greater than or equal to 5,000 rpm; (ii) the engine has no installed speed governor; (iii) the engine is not used for the propulsion of a marine "vessel" as that term is defined by the U.S. Coast Guard; and (iv) the engine does not meet the criteria to be categorized as a Class III, IV or V engine (i.e., the criteria by which an engine qualifies as "handheld"). Criteria (I) and (ii) reflect our belief that engines used to operate recreational vehicles

will operate at high rated speeds and will differ significantly in design and operation from those used to power nonhandheld equipment such as lawn, garden and construction equipment. Recreational vehicles also typically have a variable throttle that is held open by the operator to achieve speeds above idle and returns to idle when released. These vehicles experience extremely transient operation. Further, these vehicles do not have the types of governors commonly present on nonhandheld lawn and garden type engines which serve to automatically open the throttle farther when the engine experiences increased loading. Increased loading is encountered when, for example, the operator moves a lawnmower from an area of short grass into an area of long grass. Finally, we believe that the steady-state test procedures adopted for the small SI rule would not be appropriate for these more transient applications.

We established criteria which serve to define an engine as "handheld" to restrict the use of the more lenient Class III, IV or V standards to engines in equipment that needed to be extremely light in weight so that it may be easily carried or easily supported during its operation, and/or which needed to be able to operate multipositionally. Manufacturers have historically addressed need for very low weight through the use of 2-stroke technology, which produces greater power for a given weight and size (but higher emissions) than a 4-stroke engine and does so without the need for a sump full of oil at the bottom of the engine.

We adopted the small SI rule without the knowledge that approximately 8,000 small SI engines are built each year by a variety of companies (including a number of very small entities) for specific application in model boats, aircraft and cars. We did not include these engines in any

calculations of emission inventories, nor did we consider reductions from these engines or costs of compliance in the development of the Phase 1 small SI final rule or the Phase 2 proposals. We have no emission data from these engines and do not have data appropriate to determine whether the test cycle used for handheld (or nonhandheld) engines is appropriate for these engines. These vehicles are predominantly radio-controlled model airplanes and as such are clearly "recreational" in nature as that term is generally understood. However, according to the definition of that term in the existing small SI rule, such engines could qualify as handheld because of their multi positional capabilities and therefore fall outside of coverage under the term "recreational".[5]

We received no comments on the February 1999 NPRM (or the July 1999 SNPRM) with regard to our proposed treatment of this issue. Therefore, we are amending the existing regulations and we will consider these vehicles and engines as recreational and, as a result, excluded from coverage under the small SI rule. Thus, engines used to propel vehicles in flight through air provided those engines meet the other existing criteria to be categorized as recreational, are now excluded from the scope of the rule. As noted in the February 1999 NPRM, we believe that model cars and boats are not required to operate "multipositionally" to complete their intended function so that the small SI engines used in model cars and boats are therefore considered "recreational" by the existing regulatory text and are already excluded from the small SI rule.

3. Phase-in Flexibility for Small Volume Marine SI Engine Manufacturers

[5] A few of these vehicles may be controlled by flexible tether lines, but in any case they are not held in hand during operation.

We promulgated emission requirements for marine SI engines on October 4, 1996. The rules took effect with the 1998 model year for outboard engines and the 1999 model year for personal watercraft and jetboats. We developed the marine SI rule with considerable input from large volume marine engine manufacturers and their association, the National Marine Manufacturers Association (NMMA). We estimate that this rule will result in a 75% reduction in exhaust hydrocarbons when calculated from uncontrolled engines. The standards phase in via incremental reductions each year through 2006. The standards will result in considerable shifts in technology away from high emitting 2-stroke technology to cleaner 2-stroke or direct injection 2-stroke designs.

The standards are "averaging standards" in that we expect some engine families to be below the standards and generate emission credits while other engine families will be above the standards and use credits. The "averaging standards" were derived from a corporate average calculation based on the introduction of new technology across product lines. Similar to other mobile source programs, manufacturers may bank them these credits for future use or trade them between manufacturers.

We designed the phase in of the standards to permit marine engine manufacturers to introduce new technology engines and phase out old technology engines in an orderly and cost effective fashion. In addition, we developed flexible certification testing requirements and exemptions from production line testing and in-use testing requirements implemented for old technology engines to reduce the compliance costs of the rule for engines destined for phase out.

The development of the marine SI final rule took several years and involved numerous meetings with manufacturers. We published both an NPRM (see 59 FR 55930, November 9, 1994) and a SNPRM (see 61 FR 4600, February 7, 1996). We, as well as NMMA, did considerable outreach to marine engine manufacturers during this period to inform them of progress and likely requirements of various proposals. Despite this process, we received no input from small volume outboard and personal watercraft engine manufacturers until after the closing date of the comment period for the SNPRM. In this one comment, Tanaka expressed concerns about the appropriateness of the averaging standards on an engine manufacturer with likely only one engine family.[6] Tanaka also expressed doubts that credits would be available in the marketplace and questioned whether, even if available, they would be affordable to a manufacturer with a very small annual sales volume. Our Response to Comments document addressed small volume concerns by pointing out that the final rule provided reduced production line and in-use testing requirements, simplified certification procedures and administrative flexibilities for existing technology engines (the likely products of small volume manufacturers).[7] Beyond those flexibilities, the Response to Comments document explained that "for smaller volume manufacturers the final regulation allows these manufacturers to purchase emission credits from the market place as an alternative to employing control technologies to meet the standard."

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[6] Letter of May 13, 1996 from Randy W. Haslam, Vice-President, Tanaka International Sales and Marketing as contained in the docket established for the amendment portion of today' action (EPA Air Docket No. A-98-16).

[7] The "Response To Comments" document prepared for the marine SI final rule can be found in the docket established for the amendment portion of today' action (EPA Air Docket No. A-98-16).

Since implementation of the marine SI rule began, we have received further correspondence from Tanaka petitioning us to amend the rule on the basis that the rule's fleet averaging concept provides benefits to manufacturers with diverse product lines but not to a company like Tanaka, which has only one engine family–a very low production, low powered engine.[8] Tanaka argues that its competitors could sell similar engines with higher emissions because they could offset those emissions with credits from larger engines. Tanaka desires flexibility to continue production of its engine until the final phase-in of the standards at which time it will exit the market. Tanaka believes it can comply with the marine SI requirements through about the 2002 model year through engine improvement and credits it plans to generate in earlier years. After that, it desires flexibility to stage an orderly exit from the market. It does not wish to commit the funds necessary to meet the final phase in standards for its low level of U.S. sales.

Inboard Marine Corporation, a low volume manufacturer of personal watercraft engines, has also contacted us. This company maintains that it is dependent upon "off-the-shelf" technology to reduce its emissions. Like Tanaka, it has a narrow product line and argues that it cannot count on the averaging, banking and trading (ABT) program in the marine SI rule to provide credits through trading, nor to provide them at a reasonable price. Inboard Marine believes it can comply in the early years of the marine SI rule but may need relief in the late years of the standard phase-in. It intends to discontinue its current engine by the final phase-in year (2005) and meet the ultimate standards of 2006 with a redesigned engine.

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[8] Letter of June 30, 1997 from Randy W. Haslam, Vice-President, Tanaka International Sales and Marketing as contained in the docket established for the amendment portion of today' action (EPA Air Docket No. A-98-16).

We recognize that the marine SI standards are technology forcing. Thus, it was appropriate to include ABT provisions to facilitate their economical implementation. However, ABT is most useful to manufacturers with diverse product offerings. The two companies mentioned above appear to be at a disadvantage to their competitors because of their limited offerings. Further, we can not provide any certainty that credits will be available to them.

In rules proposed since we promulgated the marine SI rule, we have gone to considerable lengths to provide mechanisms to ease the implementation of new standards and requirements for low volume producers. Both the Phase 2 FRM for nonhandheld SI engines and the Nonroad CI Phase 2 and 3 NPRM contain numerous special provisions to delay or otherwise ease the impact of the standards on low volume engine families, low volume equipment manufacturers or low volume engine manufacturers. By contrast, the marine SI rule contains no such provisions.

In response to these comments, we proposed provisions in the February 1999 NPRM that would modify the marine SI rule to permit small volume engine manufacturers to have family emission limits (FELs) in excess of applicable standards where credits are not available to cover such excess. This proposed provision was limited to one period of four consecutive model years which cannot begin until the 2000 model year. We noted our belief that the affected manufacturers could likely make changes to the affected engines to achieve compliance with standards in the early years and even bank a few credits, but may have more difficulty as the standards tighten later in the phase-in. As proposed, this flexibility would have expired at the end of the 2009 model year. We noted our belief that this expiration date would provide adequate time for small volume engine

manufacturers to adapt off the shelf technology to their engines, if available, or to redesign their engines to comply with the final standards. We also noted that the inclusion of this provision was consistent with our approach in other rules and it would meet the needs of small volume manufacturers without creating adverse impacts on air quality or adverse competitive situations. Further, we noted that the way we structured this proposed provision could lead the affected manufacturers to clean up their engines more in the early years than their competitors. As proposed, the applicability of this provision was limited to engine manufacturers who sell no more than 1000 marine outboards and personal watercraft engines per year in the United States.

All comments received on the proposed flexibility provisions for small volume marine SI engine manufacturers contained in the February NPRM were favorable. Based on the technological limitations that these small volume manufacturers have, and their limited abilities to use flexibilities offered by ABT to avoid increased costs, we continue to believe that additional flexibility is appropriate. Therefore, with today's action, we are adopting the flexibility provisions as proposed in the February 1999 NPRM. Under these provisions, small volume marine SI engine manufacturers will be allowed to have family emission limits (FELs) in excess of applicable standards where credits are not available to cover such excess. This provision is limited to one period of four consecutive model years which cannot begin until the 2000 model year. This flexibility will expire at the end of the 2009 model year. These flexibility provisions are limited to engine manufacturers who sell no more than 1,000 marine outboards and personal watercraft engines per year in the United States.

The implementation of this flexibility for small volume marine SI engine manufacturers does

not change our overall conclusion that the category of marine SI engines will allow the greatest achievable emission reduction considering technology and cost.

4. Replacement Engines

In a recent direct final rule, we modified our regulations applicable to small SI and marine SI engines (see 62 FR 42638, August 7, 1997) to permit the sale of uncertified engines for replacement purposes. The direct final rule addressed limited instances involving equipment built before our regulations went into effect where engine replacement is a more economical alternative than engine repair and certified engines are not available to fit**.**

Under the direct final rule, the engine manufacturer being approached to sell an uncertified engine for replacement purposes must first ascertain that no certified engine produced by itself or the manufacturer of the original engine (if different) is available with suitable physical or performance characteristics to re-power the equipment. If the manufacturer determines that no certified engine is available that will fit or perform adequately, it can sell an uncertified engine subject to certain controls. For example, the manufacturer must take the old engine in exchange and the new engine must be clearly labeled for replacement purposes only.

Our small SI and marine SI engines regulations adopt the Clean Air Act definition for the term “manufacturer.” We have become concerned that the term “manufacturer” as defined in the Clean Air Act can include an importer who may have had nothing to do with the actual production

of the engine.[9] In such a case the requirement to ascertain whether a certified engine produced by itself has suitable physical or performance characteristics could lead to abuse. We are concerned that importers could misinterpret this provision to permit, for example, an equipment operator to import an uncertified engine and determine, since the importer does not make engines, that no certified engines are available from itself to appropriately power the vehicle. Therefore, in the February 1999 NPRM we proposed to amend the replacement engine provisions in both the small SI and marine SI engine rules to require that, in cases where a replacement engine might be imported, the determination be made by the manufacturer's U.S. representative of the company holding a current certificate of conformity from EPA for the particular make of engine requiring replacement. We proposed as an alternative, and especially if no such entity exists (as may happen in a piece of imported equipment built prior to the effective date of our regulations), the equipment operator could approach other engine manufacturers to obtain a suitable replacement engine under the existing replacement engine provisions.

We received no comments objecting to our proposed treatment of the replacement engine issue. Therefore, today's action amends the replacement engine provisions for small SI engines and marine SI engines as proposed.

III. What are the Projected Impacts of This Final Rule?

[9] Section 216(1) of the Clean Air Act defines "manufacturer" as "any person engaged in the manufacturing or assembling of new ... nonroad engines or importing such... engines for resale... but shall not include any dealer with respect to ... new nonroad engines received by him in commerce".

A. Environmental Benefit Assessment

National Ambient Air Quality Standards (NAAQS) have been set for a number of criteria pollutants, including ozone (O_3), which adversely affect human health, vegetation, materials and visibility. Concentrations of ozone are impacted by HC and NOx emissions. We believe that the Phase 2 standards being adopted today for handheld engines will reduce emissions of HC and NOx and help most areas of the nation in their progress towards attainment and maintenance of the NAAQS for ozone. The following section provides a summary of the roles of HC and NOx in ozone formation. The following section also addresses the estimated emissions impact of this rule, and the health and welfare effects of ozone, CO, and hazardous air pollutants.

1. Roles of HC and NOx in Ozone Formation

Both HC and NOx contribute to the formation of tropospheric ozone through a complex series of reactions. Our primary reason for controlling emissions from small SI handheld engines is the role of their HC emissions in forming ozone. Of the major air pollutants for which NAAQS have been designated under the CAA, the most widespread problem continues to be ozone, which is the most prevalent photochemical oxidant and an important component of smog. Ozone is a product of the atmospheric chemical reactions involving oxides of nitrogen and volatile organic compounds. These reactions occur as atmospheric oxygen and sunlight interact with hydrocarbons and oxides of nitrogen from both mobile and stationary sources.

A critical part of this problem is the formation of ozone both in and downwind of large urban areas. Under certain weather conditions, the combination of NOx and HC has resulted in urban and rural areas exceeding the national ambient ozone standard by as much as a factor of three. Thus it is important to control HC over wider regional areas if these areas are to come into and maintain compliance with the ozone NAAQS.

2. Health and Welfare Effects of Tropospheric Ozone

Short-term (1-3 hours) and prolonged (6-8 hours) exposures to ambient ozone at levels common in many cities have been linked to a number of health effects of concerns. For example, increased hospital admissions and emergency room visits for respiratory causes have been associated with ambient ozone exposures at such levels. Repeated exposures to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other health effects attributed to ozone exposures include significant decreases in lung function and increased respiratory symptoms such as chest pain and cough. These effects generally occur while individuals are engaged in moderate or heavy exertion.

Children active outdoors during the summer when ozone levels are at their highest are most at risk of experiencing such effects. Other at- risk groups include adults who are active outdoors (e.g., outdoor workers), and individuals with pre-existing respiratory disease such as asthma and chronic obstructive lung disease. In addition, longer-term exposures to moderate levels of ozone present the possibility of irreversible changes in the lungs which could lead to premature

aging of the lungs and/or chronic respiratory illnesses. Ozone also affects vegetation and ecosystems, leading to reductions in agricultural and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests, and other environmental stresses (e.g., harsh weather). In long-lived species, these effects may become evident only after several years or even decades, thus having the potential for long-term effects on forest ecosystems. Ground-level ozone damage to the foliage of trees and other plants also can decrease the aesthetic value of ornamental species as well as the natural beauty of our national parks and recreation areas.

Ozone chemically attacks elastomers (natural rubber and certain synthetic polymers), textile fibers and dyes, and, to a lesser extent, paints. For example, elastomers become brittle and crack, and dyes fade after exposure to ozone. Finally, by trapping energy radiated from the earth, tropospheric ozone may contribute to heating of the earth's surface via the "greenhouse effect," thereby contributing to global warming.[1] Tropospheric ozone is also known to reduce levels of UVB radiation reaching the earth's surface.[2]

3. Estimated Emissions Impact of this Final Rule

Table 5 presents the emission inventories for the handheld engines covered by today's action under both the baseline scenario (i.e., with Phase 1 controls applied) and the controlled scenario (i.e., with the Phase 2 controls applied). Table 5 also presents the expected emission reductions due to the Phase 2 HC+NOx standards being adopted today. The emission standards adopted in today's

action are expected to reduce average in-use exhaust HC+NOx emissions from small SI handheld engines by approximately 70 percent beyond Phase 1 standards for handheld engines by the year 2010, by which time a complete fleet turnover is expected. This translates into an annual nationwide reduction of nearly 500,000 tons of exhaust HC+NOx in the year 2025 over that expected from Phase 1.

Table 5

Projected Annual Exhaust HC+NOx Emissions from Handheld Equipment (tons/year)

Year	With Phase 1 Controls only	With Phase 2 Controls	Tons Reduced due to the Phase 2 Program*	Percentage Reduction
2000	421,000	421,000	-----	-----
2005	471,000	269,000	202,000	43.0%
2010	525,000	155,000	373,000	70.5%
2015	579,000	170,000	412,000	70.5%
2020	633,000	186,000	450,000	70.6%
2025	687,000	202,000	488,000	70.6%

* - Includes a small benefit for California engines that would need to comply with the more stringent EPA standards.

These emission reduction estimates were developed using our NONROAD emissions model. As previously stated, Husqvarna/FHP submitted a list of questions on our assumptions in the cost effectiveness for the SNPRM. (The list was prepared by the National Economic Research Associates (NERA)). Some of the questions led us to review several inputs to the NONROAD model from which the rulemaking benefits were calculated. The inputs that were reviewed included the

professional/consumer split for the largest handheld applications as well as the load factor assumed for handheld applications. Based on conversations with the major manufacturers of professional equipment and a review of available literature with regard to the load factor, we have made several modifications to the NONROAD model for the final rulemaking analysis. The modifications include class specific estimates of professional/consumer splits for chainsaws, blowers, and trimmers, and revised load factor estimates for chainsaws, blowers, and trimmers. As a result of these changes, the handheld emissions inventory estimates have increased significantly, resulting in an increase in the estimated emission benefits and improved cost-effectiveness estimates compared to the July 1999 SNPRM. The reader is directed to Chapter 6 of the RIA for today's action for a more detailed description of the changes to the NONROAD model and a more detailed presentation of the expected HC+NOx emission reductions. Because there are so few engines expected to be certified under the new Class I-A and Class I-B standards, we have not included any emissions from such engines in the HC+NOx inventory or benefit projections.

Reductions in CO levels beyond Phase 1 levels, due to improved technology, are also to be expected but have not been estimated because we do not believe we can accurately quantify the expected benefit. In addition, along with the control of hydrocarbons, the newly adopted standards should be effective in reducing emissions of those hydrocarbons considered to be hazardous air pollutants (HAPs), including benzene and 1,3-butadiene. However, the magnitude of reduction will depend on whether the control technology reduces the individual HAPs in the same proportion as total hydrocarbons. We have not attempted to quantify the anticipated reductions in HAPs due to this rule.

The intent of the amendments for small SI and marine SI engines included in this rule (as described in section II.G.) is to reduce the burden or prevent abuse of various provisions of several existing rules. As a result, we expect no significant air quality impacts one way or the other as a result of the amendments. The provisions to revise the handheld engine definition to accommodate cleaner but heavier engines remove a barrier to the incorporation of cleaner engine technology in handheld equipment. The provisions to exempt recreational engines used to propel model aircraft are not expected to have any significant impact on air quality. As noted earlier, the engines subject to the recreational exemption included in today's action have never been included in small SI inventory calculations or in benefits attributed to the small SI rules. The revisions to provide phase-in flexibility to small marine engine manufacturers will also have no significant impact on air quality. The marine rule revisions are designed to encourage these companies to clean up their engines as much as possible in the early phase-in years and may actually result in the production of small quantities of engines that are cleaner than those of similar power built by larger competitors using credits. Lastly, the revisions to replacement engine provisions will reduce the likelihood of abuse in cases where older design engines may be desired for replacement needs.

4. Health and Welfare Effects of CO Emissions

CO is a colorless, odorless gas which can be emitted or otherwise enters into ambient air as a result of both natural processes and human activity. Although CO exists as a trace element in the troposphere, much of human exposure resulting in elevated levels of carboxyhemoglobin (COHb) in the blood is due to incomplete fossil fuel combustion, as occurs in small SI engines. The

concentration and direct health effect of CO exposure are especially important for small SI handheld engines because the operator of a handheld application is close to the equipment as it functions. In some applications, the operator must be adjacent to the exhaust outlet and is in the direct path of the exhaust as it leaves the engine.

The toxicity of CO effects on blood and tissues, and how these effects manifest themselves as organ function changes, have also been topics of substantial research efforts. Such studies provided information for establishing the National Ambient Air Quality Standard for CO. The current primary and secondary NAAQS for CO are 9 parts per million for the one-hour average and 35 parts per million for the eight-hour average.

5. Health and Welfare Effects of Hazardous Air Pollutant Emissions

The focus of today's action is reduction of HC emissions as part of the solution to the ozone nonattainment problem. However, direct health effects are also a reason for concern due to direct human exposure to emissions from small SI handheld engines during the operation of handheld equipment. Of specific concern is the emission of hazardous air pollutants (HAPs). In some applications, the operator must be adjacent to the exhaust outlet and is in the direct path of the exhaust as it leaves the engine. Today's action should be effective in reducing HAPs such as benzene and 1,3-butadiene, in so far as these are components of the HC emissions being reduced by the Phase 2 standards.

Benzene is an aromatic hydrocarbon which is present as a gas in both exhaust and evaporative emissions from motor vehicles. Benzene in the exhaust, expressed as a percentage of total organic gases (TOG), varies depending on control technology (e.g., type of catalyst) and the levels of benzene and aromatics in the fuel, but is generally about three to five percent. The benzene fraction of evaporative emissions depends on control technology (i.e., fuel injector or carburetor) and fuel composition (e.g., benzene level and Reid Vapor Pressure, or RVP) and is generally about one percent. As more fully discussed in the Regulatory Impact Assessment for this rulemaking, EPA has recently reconfirmed that benzene is a known human carcinogen by all routes of exposure. Respiration is the major source of human exposure. At least half of this exposure is by way of gasoline vapors and automotive emissions. Long-term exposure to high levels of benzene in air has been shown to cause cancer of the tissues that form white blood cells. Among these are acute nonlymphocytic[3] leukemia, chronic lymphocytic leukemia and possibly multiple myeloma (primary malignant tumors in the bone marrow), although the evidence for the latter has decreased with more recent studies.

1,3-Butadiene is formed in vehicle exhaust by the incomplete combustion of the fuel. It is not present in vehicle evaporative and refueling emissions, because it is not present in any appreciable amount in gasoline. 1,3-Butadiene accounts for 0.4 to 1.0 percent of total exhaust TOG, depending on control technology and fuel composition. As discussed more fully in the Regulatory Impact Assessment for this rulemaking, 1-3-Butadiene was classified by EPA as a Group B2 (probable human) carcinogen in 1985. This classification was based on evidence from two species of rodents and epidemiologic data. EPA recently prepared a draft assessment that would determine

sufficient evidence exists to propose that 1,3-butadiene be classified as a known human carcinogen.

B. Cost and Cost-Effectiveness

We have calculated the cost-effectiveness of the Phase 2 standards contained in today's action by estimating costs and emission benefits for these engines. We made our best estimates of the combination of technologies that engine manufacturers might use to meet the new standards, best estimates of resultant changes to equipment design, engine manufacturer compliance program costs, and fuel savings in order to assess the expected economic impact of the final Phase 2 emission standards for handheld engines. Emission benefits are taken from the results of the environmental benefit assessment (see section III.A. above). The cost of this rule will be approximately $180 million annually, the result of adding manufacturer costs ranging from approximately $20 for a typical low cost residential string trimmer to approximately $56 for a typical piece of commercial equipment. The resulting cost-effectiveness of the Phase 2 standards is approximately $830 per ton of HC+NOx if fuel savings are not taken into account. If fuel savings are considered as a credit against cost, the cost-effectiveness calculation results in approximately $560 per ton of HC+NOx. This section describes the background and analysis behind these results.

In the July 1999 SNPRM, we requested comment on our cost analysis and any relevant information that would assist us in revising the analysis as appropriate. Comments on this topic were received by Husqvarna/FHP who had hired NERA to perform a study of the incremental cost and cost effectiveness using our cost data and industry-supplied cost data, separately. NERA performed

a cost benefit analyses for each set of standards, those being proposed (50-50-72 (g/kW-hr)) and those in an alternative set (72-72-87 (g/kW-hr)). NERA performed the analysis on a class basis (Classes IV and V separately) and incrementally from Phase 1 to 72-72-87 and from 72-72-87 to 50-50-72 based on the technology development situation of Husqvarna/FHP. NERA significantly underestimated the benefits of this rule due to differences in modeling assumptions NERA used compared to EPA's current NONROAD model. Additionally, some of NERA's cost estimates were higher than estimates documented in greater detail by other sources (including manufacturers) and which formed the basis for our cost analysis. NERA also submitted a list of questions on our SNPRM cost analysis requesting clarification on a number of items. A list of these questions and our responses are listed in the Summary and Analysis of Comments document in the docket. The estimates of cost and cost effectiveness we have made for this rulemaking are calculated on the basis of the standards finalized in this rulemaking (50 g/kW-hr in Classes III and IV and 72 g/kW-hr in Class V) compared to the Phase 1 standards. (For equipment subject to the State of California's regulations beginning with the 2000 model year, we have estimated the additional costs required to have that equipment comply with the more stringent federal when they take effect. Similarly, we estimate the emission reductions that would occur for these pieces of equipment. This presumes California will not revise its standards in the meantime.)

Nevertheless, we have reviewed NERA's analyses and have the following responses with regard to several specific points raised by the NERA report. With respect to NERA's concerns over licensing fees, we have chosen to use the licensing fee schedule published by John Deere even though John Deere anticipates agreements with manufacturers may result in a lower fee structure.

NERA believes we did not include the cost of modifying the fuel system when developing the costs of the compression wave technology, but we did in fact do so, using information supplied by John Deere Consumer Products, the industry member with the most experience in developing this technology. The EPA costs of adding a catalyst are lower than estimated by NERA which apparently used confidential data. The catalyst cost information used by EPA is based upon publicly available estimates provided by the catalyst industry who should be the best source for accurately estimating catalyst costs. Finally, NERA may have assumed the use of catalysts in Class V equipment which may have added to their cost compared to ours since we do not believe catalysts need be used in Class V equipment.

The analysis for this final rule is based on data from engine families certified to our Phase 1 standards, and information on the latest technology developments and related emission levels. The analysis does not include any production volumes that are covered by the California ARB's standards (except to account for the incremental costs that will be incurred as manufacturers must certify their non-pre-empted California engines to meet the more stringent EPA Phase 2 standards). The California ARB has already begun implementing a second round of emission standards for many of these engines prior to these federal Phase 2 regulations. Therefore, this analysis only accounts for costs for each engine sold outside California and those engines sold in California that are not covered by the California ARB rules, such as those that California determined are used in farm and construction equipment. We assumed that any Phase 1 engine design that would need to be modified to meet Phase 2 standards incurred the full cost of that modification, including design cost. Similarly, the cost to equipment manufacturers was assumed to be fully attributed to this federal rule

even if an equipment manufacturer would have to make the same modifications in response to the California ARB regulations. The details of our cost and cost-effectiveness analyses can be found in Chapters 4 and 7 of the Final RIA for this rule.

With regard to the amendments for small SI and marine SI engines contained in today's action (as described in section II.G.), we do not expect the revisions to increase costs for any entity. In fact, the revisions to exempt recreational engines used to propel model aircraft will eliminate potential costs under the small SI rule for affected manufacturers. The revisions to the handheld definition will provide greater flexibility in engine choice to handheld equipment manufacturers. The phase-in flexibility being adopted under the marine SI rule should reduce adverse economic impacts of that rule on small entities. Lastly, the revisions to replacement engine provisions serve only to remove a potential unintended benefit that would accrue only to importers of replacement engines who were not also engine producers. Therefore, because these amendments alter existing provisions, and that alteration provides regulatory relief, there are no additional costs to original equipment manufacturers associated with the amendments contained in today's action.

We developed costs and emission reductions associated with the Phase 1 small SI rule in support of the July 3, 1995 final rulemaking. We developed costs and emission reductions associated with the marine SI rule in support of the October 4, 1996 rulemaking. We developed costs for Phase 2 small SI nonhandheld engines in support of the March 3, 1999 rulemaking and cost for Phase 2 small SI handheld engines in support of today's action. We do not believe the amendments being adopted today affect the costs and emission reductions published as part of those

rulemaking analyses.

1. Class I-A and Class I-B Costs

No costs for Class I-A are included in this Phase 2 regulation. This is due to several factors. First, costs for research and development for engines in Class I-A are included in the research and development of handheld engine families (i.e., Classes III, IV, and V) since they are expected to be the same engine families, but would just be allowed to be used in nonhandheld applications. Second, certification and PLT testing for these engine families developed for use in handheld applications will likely be used toward certification for Class I-A. In regards to benefits, no benefits for Class I-A engine families were estimated due to the anticipated limited use (i.e., small niche markets) of these engines in nonhandheld applications. Because no Class I engine families currently exist in this displacement range, we do not expect any loss in the Phase 2 Class I emission benefits from adoption of the Class I-A standards.

The costs for Class I-B include only certification to the Phase 2 regulation. Our Phase 1 certification database (as of September 1998) indicates there are only three engine families (two of which meet the small volume engine family cutoff) that would be certified to this class, two are SV engines and one is an OHV engine, all with similar emission results for HC+NOx. The engine families can already meet the newly adopted emission standards for this class and therefore no additional variable costs or fixed costs have been included for research and development or production. In addition, the Phase 2 program allows small volume engine families and

manufacturers an option to perform PLT. No emission benefits have been included for it is not known if all of the engine families in this newly designated displacement category will utilize the new class due to the fact that these engines must be certified to the California ARB standards (16.1 g/kW-hr HC+NOx for engines between 60cc and 225cc) if they are to be sold in California. Also, the low production estimates for engine families in this class are a very small fraction of the overall engine sales in this category which make up the benefits for the Phase 2 nonhandheld engine rulemaking and therefore should have no appreciable impact on the emission benefits of the Phase 2 rule for nonhandheld engines.

2. Handheld Engine Costs

The engine cost increase is based on incremental purchase prices for new engines and is comprised of variable costs (for hardware, assembly time and compliance programs), and fixed costs (for R&D and retooling). Variable costs were applied on a per engine basis and fixed costs were amortized at seven percent over five years. Engine technology cost estimates were based on a study performed by ICF and EF&EE in October 1996 entitled "Cost Study for Phase Two Small Engine Emission Regulations" and cost estimates provided by industry. Details of the assumed costs and analysis can be found in Chapters 3, 4, 5, and 7 of the Final RIA.

Analysis of the Phase 1 certification database, as of September 1998, was conducted to determine a potential impact of the Phase 2 standards on each manufacturer assuming the ABT program would be available to engine manufacturers. While the ABT program allows credit

exchanges across classes, this analysis considered only ABT within each class since some manufacturers produce substantially in only one handheld class. The assumed schedule for implementing emission improvements for a manufacturer's engine families was based on the phase in schedule used to develop the fleet average emission standards for each engine class (i.e., 25% of production the first year, 50% the second year, 75% the third year, and 100% the fourth year, excluding any small volume engine families). The cost analysis was updated for this final rule with consideration of additional information submitted to us by manufacturers.

The Phase 2 emission standards for this diverse industry will impact companies differently depending on a company's current product offering and related deteriorated emission characteristics used in establishing FELs for use in averaging emissions across engine families. Some companies may improve the emission characteristics of their large volume engine families to provide credits for their smaller volume families. The real world impact on engine manufacturers will also be influenced by a manufacturer's ability to reduce the emissions from its major impact engine family in light of competition with others in the marketplace. For this cost analysis, we have assumed that Class III engines will utilize compression wave technology with a catalyst. For Class IV, we have assumed manufacturers will primarily use compression wave technology with a catalyst on half of their engines, and a smaller number of engines will use stratified scavenging with a catalyst or 4-stroke technology. We have assumed Class V engines will utilize compression wave technology.

3. Handheld Equipment Costs

In most cases, the companies that manufacture engines for use in handheld equipment also manufacture the equipment. There are a small number of independent equipment manufacturers which do not make their own engines. Due to the overwhelming number of equipment models manufactured by engine/equipment manufacturers compared to the small number of independent equipment manufacturers, information for this analysis was taken from our certification database which contains information from the engine/equipment manufacturers on Phase 1 engines. Additional information was added from the auger equipment manufacturers who have been in touch with us throughout the Phase 2 process. The costs for equipment conversion for handheld equipment were derived from the ICF/EF&EE cost study[10] which contains estimates based on the engine technology being utilized. Full details of our cost analysis can be found in Chapter 4 of the Final RIA. We have assumed that capital costs for equipment will be amortized at seven percent over five years.

The cost analysis for this rulemaking assumes that the bulk of Class III through V engines will be converted to either compression wave technology or compression wave technology with a catalyst. In addition, in Class IV the cost analysis assumes some engines will be converted to stratified scavenging with a catalyst or 4-stroke technology. The equipment impact was dependent on the split in technologies assumed among engines in each engine class since engine manufacturers produce almost all of the handheld equipment. The equipment design impacts with the compression wave technology with catalyst or the stratified scavenging technology with catalyst are assumed to

[10]ICF and Engine, Fuel and Emissions Engineering, Incorporated; "Cost Study for Phase Two Small Engine Emission Regulations", Draft Final Report, October 25, 1996, in EPA Air Docket A-93-29, Item #II-A-04.

include injection mold design change for the engine shroud. Modifications to the shroud design would be made to accommodate items including cooling patterns for the engine and the muffler/exhaust gas temperatures, heat shields, and potentially additional room to accommodate a potentially slightly larger carburetor and other related fuel system components. Mini 4-strokes require a total redesign of the engine shroud, tank placements, etc. for a manufacturer currently producing a 2-stroke engine. As noted earlier, this analysis assumes that Class III engines will employ compression wave technology with a catalyst. The analysis assumes that the bulk of Class IV engines will use compression wave technology either with or without a catalyst, and a smaller number of Class IV engines will use stratified scavenging technology with a catalyst or 4-stroke technology. The analysis assumes that Class V engines will utilize compression wave technology. Equipment costs are addressed in detail in the Regulatory Impact Analysis for this rule and rely heavily on analyses conducted by ICF Consulting Group as contracted by EPA. These cost estimates were modified if justified by data supplied by industry members experienced in producing this equipment.

4. Handheld Operating Costs

The estimate of total life-cycle operating costs for this final rule include any expected decreases in fuel consumption. Life cycle fuel cost savings have been calculated per class using the NONROAD emission model. The model calculates fuel savings from the years of implementation to 2027 and takes into account factors including equipment scrappage, projected yearly sales increase per equipment type, and engine power. Details on the assumptions and calculations on fuel savings

are included in Chapters 4 and 7 of the Final RIA.

Based on information described in Chapter 3 of the Final RIA, a fuel consumption savings of 30 percent has been assumed from the 2-stroke engines as they are converted to compression wave, mini 4-stroke, or stratified scavenging design with lean combustion. The new designs are expected to result in improved fuel economy because they may run on a leaner air/fuel mixture with or without improved combustion efficiency, and because they may reduce or altogether eliminate scavenging with fuel/oil mixture.

5. Cost Per Engine and Cost-Effectiveness

a. Cost Per Engine

Total costs for today's action will vary per year as engine families are phased-in to compliance with the Phase 2 standards over several years, as capital costs are recovered, and as compliance programs are conducted. The term "uniform annualized cost" is used to express the cost of today's action over the years of this analysis.

The methodology used for estimating the uniform annualized cost per unit is as follows. Cost estimates from 1996 and 1997 model years, for technology and compliance programs respectively, were estimated and increased to 1998 dollars using the GDP Implicit Price deflator (1.9% in 1996,

1.9% in 1997 and 1.0% in 1998).[11] While a number of technologies are potentially possible for these engines, the costs for three technologies were chosen in order to simplify the estimates of the technologies manufacturers will choose to implement in the future years. Engine technology costs for engine designs in Class III were based on the compression wave technology with a catalyst. Engine technology costs for most of the engines in Class IV were based on compression wave design with half of those engines using a catalyst, and the other half without a catalyst. We assumed compression wave technology costs for all engines we have good reason to anticipate will use this technology. For some engines we do not know what technology option will be used; for these we assume the cost of the compression wave technology, including appropriate licensing fees. The costs for the compression wave technology were based on comments submitted by John Deere. We also assumed a number of Class IV engines would use stratified scavenging or 4-stroke technology. The cost estimates for the catalyst system were taken from MECA and ICF, for shorter durability catalysts. We did not use Echo's cost estimate which was higher than the MECA data suggests would be necessary. We believe Echo's cost estimate may have been high since their current experience is in using catalysts on relatively high emitting Phase 1 engines. The cost for the stratified scavenging design with a catalyst was separately estimated for that technology again based upon information supplied by ICF. The costs for the 4-stroke technology were taken from Ryobi's comments on the July 1999 SNPRM. Engine technology costs for engine designs in Class V were also based on the compression wave technology, however no catalyst cost was applied for it is assumed that the Class V standards will not require catalysts. We believe the cost estimates used

[11] Information obtained from the Bureau of Economic Analysis' website (www.bea.doc.gov/bea/dn/niptbl-d.htm#).

in this analysis, including licensing fee, would be similar to the costs of other technologies manufacturers might use to comply with the new standards.

Our Phase 1 database was analyzed to determine the number of engine families per class that will likely incorporate the emission reduction technologies taking into consideration the availability of the proposed ABT program. The estimated costs per year are calculated by multiplying the number of engine families and corresponding production volume by the fixed and variable costs per technology grouping, respectively. The variable engine/equipment costs have been marked up using a 29% retail markup. All markups are based on industry-specific information from the Phase 1 program, additional analyses performed by EPA and consideration of the comments received on this item in the docket. For compliance program costs, the costs for certification bench aging are estimated based on the number of engine families in our Phase 1 database and the expected certification date under the phase in of the Phase 2 standards. To complete the calculation of the uniform annualized cost per unit, all of these costs are summed per year and then discounted seven percent to the first year of Phase 2 regulation. The yearly costs are summed and a uniform annualized cost is calculated. The uniform annualized cost is then divided by production at two points in time, the first year of full implementation of the Phase 2 standards (i.e., 2005 for Classes III and IV and 2007 for Class V), and the last year of this analysis (i.e., 2027), to obtain two separate uniform annualized costs per unit. These two values are presented in Table 6. The total cost to industry in the first year (i.e., 2002 model year costs for Class III and Class IV engines and equipment and 2004 model year costs for Class V engines and equipment) will be substantially less since only a portion (approximately 25 %) of the engines need comply with the final standards at that

time.

The yearly fuel savings (tons/yr) per class are calculated by the NONROAD model. The yearly fuel savings (tons/yr) are converted to savings (in 1998$) through conversion to gallons per year multiplied by $0.765 (a 1995 average refinery price of gasoline to end user, without taxes) increased to 1998 using the GDP deflator for 1996, 1997 and 1998. The yearly fuel savings are then calculated by dividing the yearly fuel savings by the population of Phase 2 engines in each engine class. The reader is directed to Chapter 7 of the Final RIA for more details of this analysis.

Table 6

Cost Per Unit and Yearly Fuel Savings (1998$)

(Unit Costs Based on Average Uniform Annualized Costs)

Engine Class	Cost Per Unit		Yearly Fuel Savings
	First Full Year (2005 in Class III/IV 2007 in Class V)	Long Term (2027)	
III	$23.00	$16.00	$0.50
IV	$20.00	$14.00	$1.70
V	$56.00	$39.00	$30.80

Note: Nearly all of the handheld industry is vertically integrated. Therefore it is most appropriate to acknowledge cost/unit, rather than cost/engine, because the engine and equipment manufacturers are the same in nearly all cases.

b. Cost-Effectiveness

We have estimated the cost-effectiveness (i.e., the cost per ton of emission reduction) of the Phase 2 HC+NOx standards over the typical lifetime of the handheld equipment that are covered by today's action. (Both a "high cost" estimate and a "mid-cost" estimate have been prepared and are in the RIA; however, we believe the "mid-cost" estimate more accurately represents reasonable costs to the industry.) We have examined the cost-effectiveness by performing a nationwide cost-effectiveness analysis in which the net present value of the cost of compliance per year is divided by net present value of the HC+NOx benefits. The resultant discounted cost-effectiveness is approximately $830/ton HC+NOx without fuel savings factored in, and $560 with fuel savings taken into consideration. Chapter 7 of the Final RIA contains a more detailed discussion of the cost-effectiveness analysis. It should be noted that the cost of the compression wave technology used in this analysis assumed that other manufacturers would pay the full cost of the licensing fee as announced by John Deere in December 1998. As noted earlier, no manufacturer has agreed to the licensing fee schedule as proposed by John Deere. John Deere suggests that this licensing fee may be too high and will be lowered. If the licensing fee is lowered, the cost-effectiveness as estimated for the rulemaking would be better.

The overall cost-effectiveness of this final rule based on HC+NOx emission reductions, with fuel savings factored in, is shown in Table 7 compared to the cost effectiveness of other nonroad rulemakings, which also reflect fuel savings.

Table 7

Cost-Effectiveness of the Phase 2 Handheld Engine Standards

(With fuel savings) Compared to Other Nonroad Programs

Nonroad Program	Cost-effectiveness	Pollutants
Phase 2 Small SI Handheld Engines	$560/ton	HC+NOx
Phase 2 Small SI Nonhandheld Engines	$-507/ton	HC+NOx
Phase 1 Small SI Engines	$217/ton	HC+NOx
Recreational Marine SI Engines	$1,000/ton	HC
Tier 2/3 Standards for Nonroad CI Engines	$410 to $650/ton	HC+NOx

IV. Public Participation

The process for developing this final rule provided several opportunities for formal public comment. We published an Advance Notice of Proposed Rulemaking (ANPRM) on March 27, 1997 (62 FR 14740) which announced the signing of two Statements of Principles (SOPs) with the small engine industry and several other interested parties. The ANPRM and included SOPs outlined possible programs which would increase the stringency of the small engine regulations compared to Phase 1 rules. Comments were received in response to this ANPRM which, in combination with the programs outlined in the ANPRM, formed the basis of the Notice of Proposed Rulemaking (NPRM) for Phase 2 standards which was published on January 27, 1998 (63 FR 3950). A public hearing was held on February 11, 1998 during which oral testimony was received on the proposal. Written comments were received during the formal comment period for the proposal and some additional written comments were received after the formal comment period closed. To expand upon comments received during the comment period and to address specific questions we had of the industry regarding technical feasibility and cost of some options for Phase 2 standards, we received additional information after the close of the formal comment period and participated in a number of phone conversations and meetings with industry representatives for this purpose. All of this information that was germane to Phase 2 handheld small SI standards, including documentation of

phone calls and meetings, was included in the public docket for this Phase 2 rulemaking (EPA Air Docket A-96-55).

Subsequent to the close of the comment period for the NPRM, we continued to have discussions with industry representatives, primarily from the engine industry but also representing suppliers and technology developers. Because considerable information was received after the formal comment period closed, a Notice of Availability highlighting the supplemental information was also published on December 1, 1998 (63 FR 66081) alerting interested parties to the availability of this supplemental information. (Much of this information was relied upon in support of the Phase 2 final rule for nonhandheld engines published on March 30, 1999 (64 FR 15208).) We continued having discussions with various parties regarding the rapid and dramatic advances in low emission technologies for handheld engines. In light of this new information, and in the interest of providing an opportunity for public comment on the stringent levels being considered for the Phase 2 handheld engine emission standards and the potential technologies available for meeting such standards, we reproposed Phase 2 regulations for handheld engines in a SNPRM on July 28, 1999 (see 64 FR 40940). We held a public hearing on August 17, 1999 and the formal written comment period closed September 17, 1999. All relevant information received, regardless of the date of receipt, was, to the maximum extent possible, considered in the development of this final rule for the Phase 2 handheld engines.

The amendments to the small SI and marine SI engine rules contained in today's action were proposed on February 3, 1999. We stated in the proposal that we would hold a public hearing if requested. No party requested a hearing. We provided a sixty-day public comment period, during which we received only comments in favor of the proposed amendments. These comments are available in the public docket for the amendments (EPA Air Docket A-98-16).

V. Administrative Requirements

A. Administrative Designation and Regulatory Analysis

Under Executive Order 12866, we must assess whether this regulatory action is "significant" and therefore subject to Office of Management and Budget (OMB) review and the requirements of the Executive Order (58 FR 51735, Oct. 4, 1993). The order defines "significant regulatory action" as any regulatory action that is likely to result in a rule that may:

(1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or,

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, we have determined that this rulemaking is a “significant regulatory action” because the standards and other regulatory provisions are expected to have an annual effect on the economy in excess of $100 million. An RIA has been prepared and is available in the docket associated with this rulemaking. This final rule was submitted to OMB for review as required by Executive Order 12866. As required by section 307(d)(4)(B)(ii) of the Clean Air Act, the drafts of the final rule submitted for such review, any written comments from OMB on the draft rule, all documents accompanying such drafts, and written responses thereto are in the public docket for this rulemaking.

B. Regulatory Flexibility

We have determined that it is not necessary to prepare a regulatory flexibility analysis in connection with this final rule. We have also determined this rule will not have a significant economic impact on a substantial number of small entities.

We have identified industries that would be subject to this rule and have contacted small

entities and small entity representatives to gain a better understanding of the potential impacts of the Phase 2 handheld engine program on their businesses. This information was useful in estimating potential impacts of today's action on affected small entities, the details of which are more fully discussed in Chapter 8 of the Final RIA. Small entities include small businesses, small not-for-profit enterprises, and small governmental jurisdictions. Small not-for-profit organizations and small governmental jurisdictions are not expected to be impacted by this final rule because they are not directly regulated by it. Thus, our impact analysis focuses on small businesses. For purposes of the impact analysis, "small business" is defined by the number of employees, according to published Small Business Administration (SBA) definitions. Because handheld equipment manufacturers also tend to be the engine manufacturers, which also tend to be larger businesses, there are few small business entities involved in the analysis.

However, we desire to minimize, to the extent appropriate, impacts on those companies which may be adversely affected, and to ensure that the emissions standards are achievable. Thus, flexibility provisions for the rule (discussed earlier in section II.D.) were developed based on analysis of information we gained through discussions with potentially-affected small entities as well as analysis of other sources of information, as detailed in Chapters 8 and 9 of the Final RIA. Many of the flexibilities in today's action should benefit the engine and equipment manufacturers that do qualify as small business entities.

The economic impact of the rule on small entity engine and equipment manufacturers was evaluated using a "sales test" approach which calculates annualized compliance costs as a percent of sales revenue. The ratio is an indication of the severity of the potential impacts. We expect that, at worst, three small entity engine manufacturers and five small entity equipment manufacturers would be impacted by more than one percent of their sales revenue. Also, no more than two small entities would be impacted by more than three percent of their annual sales revenue, as indicated by the analysis. This base case analysis assumes that manufacturers do not take advantage of the flexibilities being offered, but that they would be able to pass through most necessary price increases to the ultimate consumer. We would thus expect today's final rule to have a minimal impact on small business entities.

However, we are adopting a number of flexibilities to further reduce the burden of compliance on any small-volume engine manufacturers, small volume equipment manufacturers and manufacturers of small-volume engine families and small-volume equipment models. We received a number of comments from handheld engine and equipment manufacturers, which generally supported the flexibilities contained in the July 1999 SNPRM, but which suggested changes in the production caps for small volume engine families and small volume equipment models. We have incorporated the suggested change to the definition of small volume equipment model in this rule, keeping in mind equity and air quality considerations. Given these flexibilities being offered to the handheld engine and equipment manufacturers, the results of the analysis suggest that of those small entities analyzed, only one small business engine manufacturer and none of the small business equipment manufacturers would likely experience an impact of greater than one percent of their sales revenue. In addition, no small business engine manufacturers and no small business equipment manufacturers would likely experience an impact of greater than three percent of their sales revenue. Our other outreach activities have also indicated that the impact of today's final rule could be minimized, given sufficient lead time to incorporate the new technology with normal model changes. Again, we have not attempted to quantify the beneficial impact on small volume manufacturers of the lead time provided (which can include delaying the impact of these rules up until the 2008 model year for Classes III and IV and up until the 2010 model year for Class V).

Although we believe that the above-mentioned flexibility provisions will minimize any adverse impact on small entities (see Chapter 8 of the Final RIA), we have already adopted a hardship relief provision for nonhandheld engines that would also apply to handheld engines. This was developed to further ensure that standards can be achieved without undue hardship on the business entities involved. While it is difficult to project utilization of such a provision, we expect that it could further reduce any possible adverse economic impacts of this final rule.

The results of the impact analysis show minimal impacts on small businesses. We expect that such impacts will be negligible if small companies take advantage of the above-mentioned flexibilities. Most of the small companies contacted considered it likely that they would be able to pass most of their cost increases through to their customers. Many of these entities are also involved

in filling niche markets, and are thus in a particularly good position to pass these costs along to the ultimate consumers. Finally, the ample lead time contained by today's rule should also allow for an orderly transition to the more advanced technology.

C. Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 et seq. We have prepared an Information Collection Request (ICR) document (ICR Numbers 1695.06 and 1845.01) and a copy may be obtained by mail from Sandy Farmer at U.S. Environmental Protection Agency, Office of Environmental Information, Collection Strategies Division (2822), 1200 Pennsylvania Avenue, N.W., Washington, DC 20460, by email at farmer.sandy@epa.gov, or by calling (202) 260-2740. A copy may also be downloaded off the Internet at http://www.epa.gov/icr.

The information planned to be collected via this final rule is necessary to assure that the engine manufacturers required to seek certification of their engines have fulfilled all the essential requirements of these new regulations. In particular, this information will document the design of the engine for which certification is sought, the type(s) of equipment in which it is intended to be used and the emission performance of these engines based upon testing performed by or on behalf of the engine manufacturer. Additional, essential information is necessary to document the results of testing performed by the manufacturer under the production line testing program to determine that the engines, as manufactured continue to have acceptable emission performance. Finally, if the manufacturer elects to conduct testing of in-use engines under the voluntary in-use testing program, information is necessary to document the results of that in-use testing program.

Table 8 provides a listing of the information collection requirements associated with the Phase 2 program for nonroad SI handheld engines at or below 19 kW along with the appropriate OMB control numbers. The cost of this burden has been incorporated into the cost estimate for this rule. We have estimated that the public reporting burden for the collection of information required

under this rule would average approximately 87,120 hours annually for the industry at an estimated annual cost of $5,360,000. The hours spent by an individual manufacturer on information collection activities in any given year would be highly dependent upon manufacturer specific variables, such as the number of engine families, production changes, and emission defects.

Table 8

Public Reporting Burden

Type of Information	OMB Control No.
Certification	2060-0338
Averaging, banking and trading	2060-0338
Production line testing	N/A
Pre-certification and testing exemption	2060-0007
Selective enforcement audit	2060-0295
Engine exclusion determination	2060-0124
Emission defect information	2060-0048
Importation of nonconforming engines	2060-0294

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for our regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

D. Unfunded Mandates Reform Act

Section 202 of the Unfunded Mandates Reform Act of 1995 ("Unfunded Mandates Act") requires that we prepare a budgetary impact statement before promulgating a rule that includes a Federal mandate that may result in expenditure by State, local, and tribal governments, in aggregate, or by the private sector, of $100 million or more in any one year. Section 203 requires us to establish a plan for obtaining input from and informing, educating, and advising any small governments that may be significantly or uniquely affected by the rule.

Under Section 205 of the Unfunded Mandates Act, we must identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a regulatory budgetary impact statement must be prepared. We must select from those alternatives the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule, unless we explain why this alternative is not selected or the selection of this alternative is inconsistent with law.

Because this final rule is estimated to result in the expenditure by State, local and tribal governments or the private sector of greater than $100 million in any one year, we have prepared a regulatory impact statement and have addressed the selection of the least costly, most cost-effective or least burdensome alternative. While this final rule does not impose enforceable obligations on State, local, and tribal governments, because they do not produce small SI handheld engines or equipment, we have estimated the final rule to cost the private sector an annualized cost of approximately $180 million per year (over the 20 year period from 2002 to 2021). Because small governments would not be significantly or uniquely affected by this rule, we are not required to develop a plan with regard to small governments.

The impact statement under Section 202 of the Unfunded Mandates Act must include: (1) a citation of the statutory authority under which the rule is adopted; (2) an assessment of the costs and benefits of the rule including the effect of the mandate on health, safety and the environment; (3) where feasible, estimates of future compliance costs and disproportionate impacts upon particular

geographic or social segments of the nation or industry; (4) where relevant, an estimate of the effect on the national economy; and (5) a description of the our consultation with State, local, and tribal officials. Because this final rule is estimated to impose costs to the private sector in excess of $100 million per year, it is considered a significant regulatory action. Therefore, we have prepared the following statement with respect to Sections 202 through 205 of the Unfunded Mandates Act.

EPA believes that today's rule represents the least costly, most cost-effective approach to achieve the air quality goals of the rule. The analysis required by the UMRA is discussed below, and in sections II.A.-D. and III.A.-B. of today's final rule notice and in the Final RIA. See the "Administrative Designation and Regulatory Analysis" section in today's notice for further information regarding these analyses.

1. Statutory Authority

This rule adopts standards for emissions of HC+NOx and CO from small nonroad SI handheld engines pursuant to Section 213 of the Clean Air Act. Section 216 defines the terms "nonroad engine" and "nonroad vehicle." Section 213(a)(3) requires these standards to achieve the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the engines or vehicles to which such standards apply, giving appropriate consideration to the cost of applying such technology within the period of time available to manufacturers and to noise, energy, and safety factors associated with the application of such technology. Section 213(b) requires the standards to take effect at the earliest possible date considering the lead time necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period and energy and safety. Section 213(d) provides that the standards shall be subject to Sections 206, 207, 208 and 209 of the CAA, with such modifications of the applicable regulations implementing such sections as the Administrator deems appropriate, and shall be enforced in the same manner as standards prescribed under Section 202. Therefore, the statutory authority for this rule is as follows: Sections 202, 203, 204, 205, 206, 207, 208, 209, 213, 215, 216, and 301(a) of the Clean Air Act, as amended. Moreover, this final rule is being issued pursuant to a court order entered in Sierra Club v. Browner,

No. 93-0124 and consolidated cases (D.D.C.).

2. Social Costs and Benefits

The social costs and benefits of this final rule are discussed in sections III.A. and III.B. of this final rule, and in Chapters 6 through 7 of the Final RIA. Those discussions are incorporated into this statement by reference.

3. Effects on the National Economy

As stated in the Unfunded Mandates Act, macroeconomic effects tend to be measurable, in nationwide economic models, only if the economic effect of the regulation reaches 0.25 to 0.5 percent of gross domestic product (in the range of $15 billion to $30 billion). A regulation with a smaller aggregate effect is highly unlikely to have any measurable impact in macroeconomic terms unless it is highly focused on a particular geographic region or economic sector. Because the economic impact of this final rule for small SI handheld engines is expected to be far less than these thresholds, no estimate of this rule's effect on the national economy has been conducted.

4. Consultation with Government Officials

Today's final rule would not create a mandate on State, local or tribal governments, since it would not impose any enforceable duties on these entities who do not produce small SI handheld engines or equipment. Thus, we did not consult with State, local or tribal governments in the context of discussing mandated costs that would apply to such governments. However, we did consult with state governmental representatives, and with representatives of associations representing state air regulatory agencies, in the contexts of developing the most stringent achievable regulations and of addressing state ozone attainment needs. The consulted entities include the California ARB and the Northeast States for Coordinated Air Use Management (NESCAUM). These consultations are documented in the record for this rule, and are reflected in the March 1997 ANPRM, the January 1998 NPRM, the December 1998 Notice of Availability, the recently finalized Phase 2 rule for

nonhandheld small SI engines and equipment, the July 1999 SNPRM, and today's final rule.

5. Regulatory Alternatives Considered

To ensure the cost-effectiveness of this final rule and still fulfill the intent of the Clean Air Act, we have adopted numerous flexibility provisions that we expect will reduce the burden of the Phase 2 program for small volume engine and equipment manufacturers and manufacturers of small volume equipment models and engine families. The flexibility provisions are discussed in section II.D. of today's final rule. Moreover, the technological options considered for the final rule's standards and related provisions are discussed in section II.A. of today's action. Section II.B. discusses the ABT program, and section II.C. discusses the compliance program for Phase 2 handheld engines.

Throughout this rulemaking process, we have considered numerous alternatives regarding the central aspects of the Phase 2 program, including stringency levels of the standards, phase in lead time periods, compliance and testing provisions, ABT provisions, and flexibility provisions. During this process, we have also considered the costs and benefits of adopting a program that consisted of these alternative approaches. In addition to the sections of today's notice mentioned above that discuss our final rule's provisions, these alternatives have been addressed in the following documents contained in the rulemaking record: For discussions of alternative levels of standards, see sections E and O in the SOP for handheld engines in Appendix A to the ANPRM, 62 FR 14740 (March 27, 1997); sections III.A.2 and IV.A of the January 27, 1998, NPRM (63 FR 3950); and sections I.B and II.A.2 of the July 28, 1999, SNPRM (64 FR 40940). Discussions of alternative phase in lead time periods are located in section C of Appendix A to the ANPRM; sections III.A.2 and IV.A of the NPRM; and sections I.B and II.A.2 of the SNPRM. For alternatives regarding compliance and testing provisions, including the ABT program, see sections G -J and section M of Appendix A to the ANPRM; sections III.B and IV.B-D of the NPRM; and sections I.B and II.B-C of the SNPRM. Alternative provisions for flexibilities are in section L of Appendix A to the ANPRM; section IV.E of the NPRM; and section II.D of the SNPRM. Assessments of costs and benefits of alternative approaches to the program that we anticipated at different stages of

development of the rule are located in sections V, VI, and VIII of the NPRM; sections III.A-B and V of the SNPRM; and in the draft RIAs for the NPRM and SNPRM. As stated above, having considered these alternatives over the course of the rulemaking, in EPA's view the final program is the least costly and most cost-effective rule that achieves the objectives of section 213(a)(3) of the Clean Air Act.

E. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 et seq., as added by the Small Business Regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. We will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the Federal Register. This rule is a "major rule" as defined by 5 U.S.C. 804(2). This rule will be effective [**insert date 60 days following publication in Fed Register**].

F. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Pub L. No. 104-113, § 12(d) (15 U.S.C. 272 note), directs us to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs us to provide Congress, through OMB, explanations when we decide not to use available and applicable voluntary consensus standards.

This final rule involves technical standards. While commenters on the January 1998 NPRM suggested the use of ISO 8178 test procedures for measuring emissions, we have decided not to

adopt the ISO procedures in this final rule. We believe that these procedures would be impractical because they rely too heavily on reference testing conditions. Since the test procedures in these regulations will need to be used not only for certification, but also for production line testing, selective enforcement audits, and voluntary in-use testing, we believe they must be broadly based. In-use testing is best done outside tightly controlled laboratory conditions so as to be representative of in-use conditions. We believe that the ISO procedures are not sufficiently broadly usable in their current form for this program, and therefore should not be adopted by reference. We are instead continuing to rely on the procedures outlined in 40 CFR Part 90. We are hopeful that future ISO test procedures will be developed that are usable for the broad range of testing needed, and that such procedures could be adopted by reference at that point.

G. Executive Order 13045: Protection of Children's Health

Executive Order 13045, entitled "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 19885, April 23, 1997), applies to any rule that: 1) was initiated after April 21, 1997 or for which a Notice of Proposed Rulemaking was published after April 21, 1998; 2) is determined to be "economically significant" as defined under Executive Order 12866; and 3) concerns an environmental health or safety risk that we have reason to believe may have a disproportionate effect on children. If the regulatory action meets all three criteria, we must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives we considered.

This final rule is not subject to Executive Order 13045, because substantive actions were initiated before April 21, 1997 and we published a Notice of Proposed Rulemaking before April 21, 1998. This final rule is also not subject to Executive Order 13045 because it does not involve decisions on environmental health or safety risks that may disproportionately affect children.

H. Executive Order 13132: Federalism

Executive Order 13132, entitled "Federalism" (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" is defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government."

Under Section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

This final rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Today's final rule will not impose any enforceable duties on these entities, because they do not produce small SI handheld engines or equipment. Thus, the requirements of section 6 of the Executive Order do not apply to this rule. Although section 6 of Executive Order 13132 does not apply to this rule, we did consult with officials from the State of California in developing this rule. The State of California also regulates small SI engines and the purpose of the consultations was to develop harmonized requirements, to the extent possible, between our Phase 2 program for small SI handheld engines and California's program for the same engines.

Under section 209(e)(2) of the Clean Air Act, the State of California may adopt and enforce standards and other requirements relating to the control of emissions from new nonroad engines or vehicles if California determines that its standards will be, in the aggregate, at least as protective of public health and welfare as applicable federal standards. In such cases, other states may adopt and

enforce standards that are identical to California's. Therefore, today's final rule does preempt state and local law to the extent provided by section 209(e)(2). Although this rule was proposed before the November 2, 1999, effective date of Executive Order 13132, we provided state and local officials notice and an opportunity for appropriate participation when we published the January 1998 NPRM and July 1999 SNPRM. Thus, we have complied with the requirements of section 4 of the Executive Order.

I. Executive Order 13084: Consultation and Coordination with Indian Tribal Governments

Under Executive Order 13084, we may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or we consult with those governments. If we comply by consulting, Executive Order 13084 requires us to provide to the Office of Management and Budget a description of the extent of our prior consultation with representatives of affected tribal governments and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires us to develop an effective process permitting elected officials and other representatives of Indian tribal governments "to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities."

Today's final rule will not significantly or uniquely affect the communities of Indian tribal governments because it will not impose any enforceable obligations on them. Accordingly, the requirements of Section 3(b) of Executive Order 13084 do not apply to this final rule.

VI. Statutory Authority

Authority for the actions set forth in this final rule is granted to us by Sections 202, 203, 204, 205, 206, 207, 208, 209, 213, 215, 216, and 301(a) of the Clean Air Act as amended (42 U.S.C. 7521, 7522, 7523, 7524, 7525, 7541, 7542, 7543, 7547, 7549, 7550, and 7601(a)).

List of Subjects in 40 CFR Parts 90 and 91

Environmental protection, Administrative practice and procedure, Air pollution control, Confidential business information, Imports, Incorporation by Reference, Labeling, Nonroad source pollution, Reporting and record keeping requirements, Research, Warranties.

Dated:

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Carol M. Browner,

Administrator